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Editor Second Part.

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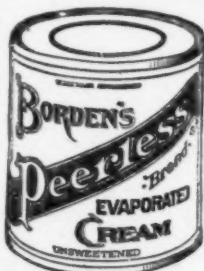
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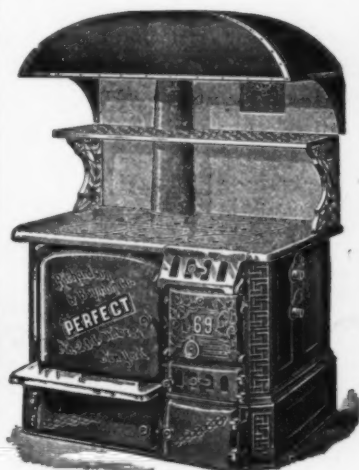
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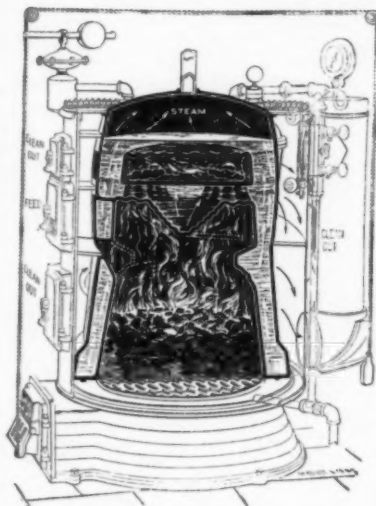
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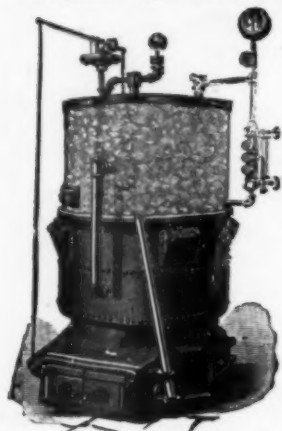
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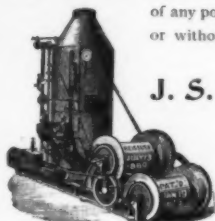
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JOURNAL
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"I cannot help plead to my countrymen, at every opportunity, to cherish all that is manly and noble in the military profession, because Peace is enervating and no man is wise enough to foretell when soldiers may be in demand again."—SHERMAN.

VOL. XV.

MAY, 1894.

NO. LXIX.

COAST DEFENSE, INCLUDING SUBMARINE MINES.*

BY BREVET BRIG.-GEN. HENRY L. ABBOT, U. S. ARMY.

COLONEL, CORPS OF ENGINEERS.

IT is not surprising to find diversity of opinion even among experts as to the best system to be adopted for defending the sea-coast. In truth, the problem, like a chameleon, assumes different aspects from its surrounding conditions. It can only be stated in general terms that the physical characteristics of the seaboard, the development of the commercial marine, the possession or lack of colonies, and the nature of the home production of the country (*i. e.*, whether sufficient to support life or otherwise) must determine the respective functions of the army and navy, and the nature and extent of the land fortifications.

The subject has received much attention from English engineers. The commerce of that country extends to every sea, her colonies are found in every quarter of the globe, and the population of the British Isles is dependent for the most necessary supplies of food and raw materials upon the products of other lands. Preponderating sea power is, therefore, for her a necessity of national existence, and must be maintained against her rivals at

*Read before the International Congress of Engineers at Chicago, and published in the JOURNAL by permission of Major Clifton Comly, Chairman of the Division of Military Engineering.

whatever cost. But so long as she holds the command of the sea her coasts are little exposed to insult, especially as the length within easy reach of attack is restricted to limits so narrow as greatly to simplify the problem. Hence until recent times, although lying in the near vicinity of powerful rivals, no local land defenses for the ports of England and Ireland were deemed necessary.

But modern developments have introduced changes of policy even for this mistress of the seas. About thirty-five years ago the subject of home defense engaged serious attention, and after careful investigation at the war office and by royal commissioners, an extensive system of land defenses for the great naval arsenals and dockyards was inaugurated, involving an outlay of upward of \$50,000,000. The following extracts from the reports convey briefly the fundamental principles adopted:

"Your commissioners are therefore of opinion that the fortifications of this country should be confined chiefly to the protection of those vital points at which an enemy would strike, and of harbors whose possession would give him sure bases of operations in positions favorable to his designs.

* * * * *

"The protection of the dockyards against attack by sea is obviously the first point for consideration; for in their present state an enemy might, in the temporary absence of our fleet, or in the event of any contingency giving him command of the channel, destroy any of these establishments without the necessity of landing upon our shores.

* * * * *

"If the naval resources of Great Britain are to be applied to the best effect, our defensive arrangements should be such as to require that the number of ships and sailors fettered to our ports should be as few as possible. Any means that can be adopted to reduce the number of vessels and seamen required for the defense of our arsenals is an addition to our naval power. Fortifications at once increase both our offensive and defensive power, for, by their aid in the defense of our bases of operations at Portsmouth and elsewhere, we are enabled to apply our naval means in such a manner as to afford the greatest amount of offensive power against the enemy, and of defensive power for the general protection of the kingdom."

With Great Britain, therefore, the accepted system of coast

defense is determined by the necessity of holding command of the sea by a vast navy ; but the latter is not now wholly trusted, being supplemented by land defenses at the great arsenals and naval depots. This costly system receives the assent of the nation because the imperative need of maritime supremacy compels the maintenance of the huge navy, and clearly every possible assistance therefrom should be drawn to balance the unavoidable cost.

In this connection it may be well to consider the cost of such a navy. It consists of two elements, original construction and maintenance. The following figures from Lord Brassey's Naval Annual for 1892 exhibit the sum now invested in the British navy as closely as it can be estimated :

First cost of ships not included in next item . . .	\$ 83,750,230
First cost of ships completed in 1870-92 . . .	220,317,320

Total first cost of existing navy	304,067,550
---	-------------

To maintain this navy without increase involves an annual expenditure for depreciation of 4 per cent. for armored, protected, and partially protected ships, and guard, receiving, training, and harbor vessels; of 5 per cent. for small vessels, tugs, and yard craft; of 6 per cent. for corvettes, sloops, torpedo cruisers, gun vessels, gunboats and troop ships; and of 9 per cent. for torpedo boats, steam launches, etc. The annual expenditure required for replacing the vessels built since 1870 and thus keeping the fleet in its present serviceable condition, is estimated upon this basis at \$10,315,545. These figures illustrate how mistaken is the popular idea that steel ships of the modern patterns are imperishable. The fact is that their life is shorter than that of the old live-oak types. The corrosion which has made its appearance on some of our new war vessels already indicates this deterioration, and has led to the suggestion that wood sheathing and coppering with its increased cost and diminished speed is advisable.

But these figures by no means exhibit the annual naval burden upon the taxpayers of England. The total number of officers, seamen, boys, coast-guard, and Royal marines is 74,100. The Naval Estimates for the year 1892-93 contain the following items:

Total effective services, including repairs, etc. . . .	\$60,802,000
Total noneffective services, half pay, pensions, etc. . . .	10,097,500
Extra estimate for colonial services	301,500
To which should be added for replacement, as above	10,315,545

Total annual expenses	81,516,545
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The command of the sea at present thus involves an original outlay of upward of \$300,000,000, and an annual expenditure of upward of \$80,000,000. For England this is a condition of national existence, as already stated; but before a free people like that of the United States will submit to so grinding taxation it must appear that command of the sea is necessary to our natural development.

But actual facts prove supremacy on the ocean to be by no means a necessity with us. We have no entangled alliances with foreign governments, and no desire for foreign military conquests. Our only present need for a navy is for such representation abroad as our dignity as a nation demands, and for national defense. Without in the least questioning the importance to us of this element of national greatness, it is apparent that our naval problem is different from that of Great Britain in every essential element. Although our coastwise commerce is enormous, comparatively little foreign traffic is carried in American bottoms, and consequently we have only a small commercial marine to protect; we have no colonies to be defended; our population is independent of the rest of the world in respect to all supplies of primary importance, whether for peace or war; and consequently we could not be coerced into submission even if every one of our ports was blockaded.

These facts appear to be so well understood that when the Naval Policy Board of 1890 submitted a project for an American navy consisting of 126 ships of all classes and 101 120-foot torpedo boats, at an aggregate cost of \$349,515,000, it received the approval neither of the Navy Department nor of Congress, and the present new navy is constructing upon a much more moderate basis. That the rehabilitation of our naval establishment is needed, and that the policy adopted receives the approval of the people, is undoubted; but it is equally true that we are exempt from the necessity of creating and maintaining a fleet competent to cope with the power of England, or that of her great rivals upon the ocean. We always have been and must look forward to remaining inferior in sea power to that nation and to its natural enemies, because our interests do not compel us to support the burden of taxation which such a rivalry would impose. Our system of coast defense should therefore recognize this fact, and be based upon a wholly different plan. We have no more reason for adopting England as our standard for a naval establishment

than we have for adopting Germany as our standard for the strength of our army. We need neither a huge navy nor a huge army for our national development, but we cannot afford to fetter our necessary ships of war to our ports of entry.

What, then, are our real needs in the way of coast defense? The United States has an immense seaboard, exceeding 3000 miles in length on the Atlantic and Gulf coasts, and half as much more on the Pacific, not including Alaska. Northward from New York City the shore is generally bold, with many good harbors; but southward, and including the Gulf, the coast is bordered by a cordon littoral of sand, through which entrances deep enough to admit modern war-ships are few in number and generally difficult of navigation. On the Pacific coast the shore is bold and so closely bordered by mountains difficult of passage as to leave only three or four important harbors until Puget Sound is reached.

The United States has also extensive water frontiers on the Great Lakes and at Alaska; but as the former would only be exposed to attack in the improbable event of a war with England, and even then under conditions much more favorable to us than those existing on the seaboard, and as the latter has not yet the development which demands immediate attention, neither will be considered here.

Upon the whole extent of the Atlantic, Gulf, and Pacific coasts there are about thirty ports which demand local protection for their cities now exposed to occupation or destruction, and of these about a dozen are so important as centres of commercial wealth that the entire country has much at stake in their security. Nine out of this number are also important as containing naval stations and depots of supply, without which our new ships of war would be unable to keep the sea or perform any service in war; for it must not be forgotten that naval bases are as indispensable in these days of steam as are bases of supplies for armies in the field. In fact, this statement hardly puts the matter strongly enough, for our new ships would be exposed to capture and use against us, if they should attempt to operate on their natural element, the ocean, without ports of refuge in which to find security when overmatched.

Besides these thirty ports now urgently demanding protection, there are about seventy others whose local importance would justify inexpensive earthworks; which, armed with the best of our older types of ordnance, and having in view the

small inducements offered to an enemy to attack, would afford the needed protection.

Under the provisions of an act of Congress approved March 3, 1885, a joint Board of army and navy officers and civilians, presided over by the Secretary of War, was appointed by the President to "examine and report at what ports fortifications or other defenses are most urgently required, the character and kind of defenses best adapted for each with reference to armament," and "the utilization of torpedoes, mines, or other defensive appliances." The report of this Board has formed the basis upon which Congress has acted in inaugurating the present system of defense of the coasts.

This Board recommended the expenditure of \$93,448,800 for land defenses and their armament, \$4,334,000 for submarine mines and their adjuncts, and \$28,595,000 for coast-defense vessels and their armament and for torpedo boats. Allowing a moderate sum for the defense of Puget Sound, of which the growing importance now justifies a further allotment, this indicates a total expenditure of about \$100,000,000 for army defenses, including submarine mines, and \$30,000,000 for naval auxiliaries. The cost of maintenance of the land works would be trifling; and yet the entire coast would be placed in a condition of security even if operated against by the largest naval means which could be brought against it. These figures are striking when compared with the expenditures which the taxpayers of Great Britain are compelled to contribute for maintaining their system. Their regular tax every twenty months would more than suffice to enable us to defy the world for a generation.

But it may be urged that funds expended in works of coast defense may soon become a bad investment, and the new system become antiquated by reason of future developments in naval constructions, as has already proved to be the case with the old stone forts. The answer is obvious. The old forts are by no means worthless, because if protected against the attack of modern ships by modern high-power guns suitably mounted, they will still serve admirably to cover the mined fields against counterminers. They retain much of their original value or vitality, while the old ships which they were designed to resist are now wholly consigned to the scrap-heap. Moreover, present protection for our great ports is an urgent necessity, and if we wait for perfection all progress is stayed. This policy of delay, if adopted,

would be fatal to all modern development, both civil and military, and is inconsistent with the spirit of the nineteenth century.

In fine, our true policy for coast defense is to fortify the chief ports along our coasts, so as not only to protect the adjacent cities and arsenals against insult, but also to provide safe refuges for our coastwise marine, and safe naval bases with coaling stations, depots of supply, and places of refuge for our ships of war when threatened by superior forces on the ocean, whence they may issue to act offensively as circumstances permit. This would render any attempt to blockade a wide expanse of coast impracticable, and would leave our ships of war free to operate on the lines of supply of the enemy if he should attempt to concentrate and attack any particular port.

During the civil war our fleets had nothing to fear from the Confederate navy, and could cruise in a manner to cover all ports of entry against blockade runners. If the enemy had had a few battle-ships operating on our long line at pleasure, our plan of conducting the blockade would have failed. Experience has thus demonstrated the proper naval policy to be observed when a preponderating naval force is operating on our coasts. The plan sometimes advocated of stationing a few coast-defense vessels in our chief ports as a substitute for fortifications, would not only afford inadequate protection, but would also permit an effective blockade of the coast, and would thus fail in the very point upon which so much stress is laid by the advocates of a purely naval defense. Such a disposition would reduce the navy to the rôle of inefficient port protectors, and would leave our harbors blockaded and our coastwise shipping without support. If, on the other hand, our fleet were concentrated, the blow might fall and the mischief be accomplished at some uncovered point.

Accepting, then, the conclusion that land defenses are a necessity, the next matter to consider is what should be the general character of these coast fortifications. This will depend on the nature of the attack to be apprehended. A coast line may be assailed either by an army debarked for invasion, or by a purely naval attack to effect the destruction or ransom of property lying within range of its guns. The latter method involves much less expense and risk of disaster than the former; and, partly by reason of remoteness from Europe, and the chronic political complications there existing, which would render large detachments of troops dangerous and improbable, and partly because it is well

known that the network of railroads which covers our country would permit a very rapid concentration of our entire available military strength upon an invader, we have little reason at present to apprehend the descent of an army upon our coasts. At any rate, whether this confidence is well grounded or not, it is quite certain that our first efforts should be directed to preparations to repel purely naval attacks. Until that is accomplished we are exposed to great disasters, inflicted with little risk to the enemy. In fact, it has always been an accepted principle of American coast defense to so plan the works as to compel the enemy to debark and face us on land before he can hope to obtain any important success.

Water batteries and their adjuncts, and not elaborate land fortresses, thus constitute the basis of the system. Nevertheless, assaults by boat parties designed to seize and destroy the armament may be apprehended, even where no permanent lodgment would be ventured. This is specially probable at outlying positions commanding important channels. In such places local provisions for defense other than those which could readily be improvised at the outbreak of hostilities may be demanded. In general, however, as it is undesirable to have the supporting troops exposed in the vicinity of coast batteries in action, they will be encamped in some covered position near by, and will establish nightly suitable guards to cover the approaches. Where this system is applicable, peace preparations may be limited to the emplacements for heavy guns. These are expensive and require time for construction, while the resources familiar to field fortification will often enable the works for repelling assaults by boat parties to be deferred to the outbreak of war.

Upon these principles our coast defenses in general are limited to detached batteries widely spaced and concealed as much as possible, sometimes with local flanking arrangements for the use of the cannoners pending the arrival of the reserves. In this respect our works present a notable difference to those in England, where from the near vicinity of the Continent the danger of grand descents is much more to be apprehended.

Works of coast defense are required (1) to protect our cities from distant bombardment from the ocean; (2) to bar the passage of fleets through narrow channels leading to important places; (3) to forbid the occupation of harbors useful to an enemy; and (4) to coöperate with naval coast defenders in closing wide entrances

of value leading to important landlocked bays or sounds. Each will be considered in turn.

It fortunately happens that very few of our most important positions on the sea-coast are occupied by cities built immediately upon the shore, and hence it is generally possible to occupy advanced sites which will place our vulnerable points beyond the reach of hostile bombardment at practicable ranges, say 6 miles or less. Where such sites for the batteries are not available our policy is to sweep all practicable bombarding areas with a heavy fire, and to trust to the coöperation of naval torpedo boats acting offensively.

In general, to approach within effective range of our chief ports it is necessary to traverse narrow landlocked channels where ships cannot escape the close fire of land guns. At such sites two preparations should be made, neither of which can safely be left to the outbreak of hostilities. Modern high-power guns must be put in position, capable of contending with and overpowering the armament of the largest armored ships which can traverse the channel; and provisions must be made for obstructing the waterway in some manner which can be trusted to bar the route against an attempt to force a passage rapidly past the batteries without engaging them.

In selecting the position for the works, local topography often exerts a governing influence. The best conditions are where the ground rises some 100 to 200 feet above the water; where a wide development is offered to the land guns, and a contracted field of battle to the enemy; where the depth, tidal oscillation, and currents are moderate, thus permitting the use of submarine mines as an effective obstruction; and where the soil and sanitary conditions are suitable to the objects intended.

In selecting a site to meet an enemy coming from the sea the engineer has one great advantage not possessed when making a similar selection for encountering an army in the field. A land fortress chosen in advance may usually be passed, and the battle be forced beyond reach of its guns. On the approaches to a landlocked water route, nature provides only a few channels where ships can move, and that particular site for defense can be chosen by the engineer where they will operate under the maximum disadvantages, and yet where they must certainly pass to effect their object. This is the answer to the common fallacy urged by the advocates of floating batteries, that land guns are "chained

monsters," while guns afloat may be shifted to meet the enemy wherever he appears. This argument fails doubly. He should be compelled to fight where we have every possible advantage; and the guns should be sure to be in position when wanted. Mobility implies the possibility that they may be drawn away by skilled manœuvres of the enemy and the channel be left uncovered at the critical moment. Moreover, a land armament is not exposed to ramming or torpedo attack, while a coast-defense fleet is as likely to suffer in this manner as the enemy himself. Finally, the fact that a land gun involves an outlay of only from one-third to one-fifth as much as one mounted on shipboard in first cost, and of almost nothing for maintenance, makes it clear that no question exists as to the relative merit of the two systems of defense for navigable channels.

To forbid to an enemy the occupation of a harbor useful for his purposes is a simple operation. It only requires a few modern mortars in a battery suitably designed to facilitate accuracy of fire and well protected against the operations of landing parties. Should we become possessed of foreign coaling stations, this plan, with appropriate local modifications, would probably meet all needs.

The increased range of modern ordnance has rendered possible a somewhat new application of land batteries to the defense of the coast. There are certain entrances to large inland waters, like Long Island Sound and Puget Sound, which are too wide to be properly closed with land defenses alone, especially as the depth and strength of the current forbid the effective use of submarine mines. Here there will be great advantage in reinforcing land fortification with armored coast-defense vessels and torpedo boats. Heretofore such channels have necessarily been left open, or only to be defended if possible by uncertain fleets. Hence, to give the needed security to the ports situated on such inland waters, it has been necessary to defend each by local works. Under the new conditions it is believed that it will be possible to concentrate a greater part of the land guns at the entrance, and thus provide positions (not unlike the *forts d'arrêt* now receiving attention abroad for defending mountain passes), where a moderate naval force of coast-defenders and torpedo boats may have their flanks powerfully reinforced, and may find sufficient support to contend with advantage against greatly superior forces afloat. To furnish a fleet decidedly inferior in strength to that of

the enemy, with a battle field prepared in advance to give immense advantages to the defense, is no small gain; and this can be accomplished, at such sites as those under consideration, at vastly less expense than by the alternative of providing a fleet of coast-defense vessels large enough to cope alone with the enemy. Plans have been projected officially for holding the eastern entrance of Long Island Sound upon these principles, and others for the entrance to Puget Sound are contemplated. These plans for Long Island Sound have been indorsed by the Connecticut State Board of Trade and by the State Legislature, and the latter has petitioned Congress for the early construction of the works.

The defense of Chesapeake Bay is projected upon a different system, better suited to the local conditions. The approaches to Hampton Roads are to be strongly fortified, thus directly covering the Navy-yard at Norfolk and the city of Richmond, and giving our fleet (supposed to be smaller than that of the enemy) a secure position whence it may issue at will to operate upon his lines of communication if he attempts to enter the bay. Such a disposition will compel him to mask our naval force with a superior fleet before he can attempt interior operations. The only great cities upon the waters of Chesapeake Bay north of Hampton Roads are Baltimore and Washington, and both admit of strong local defense at moderate cost. The existence of such a naval *place d'armes* at the entrance will therefore probably deter the enemy from making any serious attempt upon the shores of the bay.

The armament and its adjuncts suitable to contend with a modern fleet are next to be considered. They consist of high-power guns, modern mortars or howitzers for vertical fire, rapid-fire guns for sweeping the approaches against boat operations, machine guns for local flanking, and submarine mines for obstructing the channels of approach.

What calibres of high-power guns are demanded? Evidently the answer must depend upon the work they will have to perform in contending with the armored fleets now in existence, and likely to be constructed in the future. But battle-ships have undergone and are now undergoing continual development. The problem to be solved for them is to obtain the maximum protection consistent with flotation and sufficient carrying capacity for the armament, coal and other necessary supplies. Under the spur of competition improvements in armor have been rapid, passing

from wrought iron, compound wrought iron and steel, forged steel, and very recently nickel steel specially hardened, until penetration has been replaced by shattering with an economy in weight of one-fourth and upward for equal protection. The mode of application has also been radically changed. The early attempts to afford complete cover have yielded gradually to the present limits of water-line and heavy gun protection, thus uncovering all but what are regarded as the vitals of the ship, until in some recent types only about one-fourth of the side is armored. These changes have resulted from the corresponding development of high-power guns, which at first took the form of increasing calibres until the resulting weights of the armament and ammunition overtaxed carrying capacity. Next followed improvements in powder, which have given the means, without reducing power, of diminishing the mass of the projectiles by increasing the velocity of flight. At present the tendency appears to be decidedly toward lighter guns on shipboard, the limit falling from 110 tons and upward to about 67 tons, with a correspondingly large increase of the secondary armament. Whether the very recent improvements in the resisting power of armor may not bring about a new increase of calibres remains to be seen.

It is to be noted that these developments have all resulted from the desire of increasing the efficiency of ships of war in their contests with each other, and not with a view of adapting them to contend with forts. In fact the changes have in general tended to unfit them for the latter duty. Thus the flatter trajectories resulting from increased velocity are far less effective than the curved fire so much dreaded by land batteries. Close ranges must be sought to bring the secondary armament into action; but this will give increased value to the greater precision of fire afforded by stable instead of movable platforms. Finally, the reduction in side armor is wholly a gain to men contending behind the much more perfect cover obtainable on land.

It is clear that the reduction of calibres on shipboard by no means demonstrates the wisdom of a corresponding reduction for the shore defenses. The solid earth will support any weights. It has always been a recognized principle that superior power is an immense advantage in an artillery contest. Gen. Totten's dictum that in a battle with shipping "every shot should be a bird" is as true now as when he advocated the introduction of

15-inch guns for shore batteries, although no one then supposed that such calibres could be served on shipboard. If modern conditions have limited the size of the armament which can profitably be brought against us, it is no reason why we should waive the resulting advantage. Moreover, larger bursting charges for shells, whether of black powder or high explosives, are of great value, and can be secured only by adopting large calibres. The Endicott Board recommended 8-inch, 10-inch, 12-inch and 16-inch guns, each of the ascending series having roughly double the power of the preceding. All have already been put under construction except the last, and Congress has authorized the procurement of tools for its fabrication. Although the English pattern for the 110-ton gun has not proved satisfactory, the fabrication of a similar calibre on the continent of Europe has led to opposite conclusions, and our Ordnance Department urges its manufacture. Indeed there is little doubt that such guns will soon be ordered and mounted in our coast defenses; only a few of them will be required, but for the sites for which they have been recommended no smaller calibres will meet the needs. It should be remembered that the ships will decide the ranges to be used in battle, and will be careful to present their armor obliquely to land gunners. The knowledge that the defense has guns able to pierce their vitals under the latter unfavorable condition, will compel them to keep so far away that their annoying secondary armament will be ruled out of the contest. The 8 inch and 10-inch guns have sufficient shell capacity to be very effective against their unarmored portions, even at long ranges.

The largest high-power guns will be mounted in iron turrets. The 12-inch guns will be placed in iron casemates or on gun-lifts served by hydraulic power, in a manner which has been successfully tested. The 10 inch and 8-inch guns will be served on disappearing carriages on all sites less than 250 feet above the water level. Above that height the ordinary non-disappearing type will be used.

In the matter of mortar or high-angled fire it is believed that American ideas are in advance of any existing European constructions, although indications are not lacking that the subject is now attracting serious attention abroad. We have adopted a single calibre, 12 inches, in order to secure sufficient weight in the projectile to insure deck penetration, and sufficient capacity for large charges of high explosives. Recent experiments at Sandy

Hook, as well as reports from Europe, induce the belief that either of two varieties of high explosive may be safely used in charges as large as 100 pounds in high-angled fire, and that ranges of at least 5 miles may be employed with sufficient precision to render the service appalling to shipping. The greater the distance of the vessel from this kind of battery the greater her danger if struck. Moreover, recent developments in naval construction aggravate the danger from such blows. The protective deck is placed below the water line, while above it are emplacements for the secondary armament and the great body of the cannoneers, covered by an upper deck. Shells falling on this wooden deck can hardly fail either to penetrate below the protective deck and act among the magazines, engines, and boilers, or else to explode in the confined space above, where their destructive effects upon the crew will be hardly less terrible. This double target will render a cheaper kind of a projectile available than if armor piercing were essential, although the lightness of all deck armor renders its penetration comparatively a simple problem. Several batteries for this kind of fire are now under construction, specially designed to increase precision of fire and augment the number of projectiles with a view to overcome the relative lack of accuracy inherent in vertical fire as compared with horizontal practice.

Rapid-fire guns, chiefly of 12 centimetres (4 7/8 inches) calibre, are favored for sweeping the mined fields and water approaches. They will be mounted on the balanced pillar principle, so that perfect concealment in pits will be practicable until they are brought into action. Their fire in many cases will be reinforced by that of the old guns retained in their old positions, and arranged to be fired automatically when the mines are disturbed by night or in fogs. Local flanking will generally be given by machine guns in fixed positions, or served as light batteries, according to circumstances.

Submarine mines will be used to obstruct the passage of vessels past the batteries. They will not be restricted to single lines, through which it is too easy to countermine, but will be distributed over considerable lengths of the channel where they can be covered by a heavy fire of flanking guns. The mines are of the electric type, exploded automatically at contact with the vessel or by judgment at the will of the operator. Ground mines of cast-iron are preferred for shallow water not exceeding 30 feet; and buoy-

ant mines of steel, spherical in form, for deeper channels. The size of the latter is adjusted to furnish the requisite buoyancy, which varies with the depth and strength of the currents. Experience has shown that where the depth exceeds about 100 feet and the velocity of the current is over 7 feet per second, the size becomes too great to admit of successful working. Tidal oscillations greater than 10 feet introduce serious difficulties in obstructing a channel by mines, but it fortunately happens that at none of our important ports is this range exceeded. Where more than one passage exists, channels not needed for our vessels will be closed by self-acting mines dangerous alike to all comers. A pattern perfectly safe to plant, self-destructive if set adrift, and exceedingly difficult to remove has been adopted.

Firing mines by judgment meets with but little favor in our service. The destructive range increases even less rapidly than the square root of the charge, and unless wasteful quantities of the explosive are used, the difficulty of determining the exact relative position of the mine and the ship will lead to failures, especially in the case of buoyant mines which swing considerably with the tide. By night and in fogs a judgment system would be worthless. Hence many small charges well distributed and exploded automatically at the shock of the vessel are preferred. By the use of electricity as the igniting agent, such mines will be harmless to our own vessels. The usual charge for contact mines is 100 pounds, and explosive gelatine or dynamite No. 1 is preferred for service. The electric fuse contains 24 grains of mercuric fulminate, and is ignited by a current of half an ampère. Mines are usually designed to be spaced at 100 feet apart, thus allowing for moderate errors of planting, since they are not mutually destructive at distances of about 40 feet. A 500-pound countermines works no injury at a range of 80 feet. It is considered that a channel defended upon the system adopted cannot be traversed with impunity until cleared by the operations of the hostile fleet, and the extreme difficulty of effecting this object under the close fire of the land guns will render such obstructions far more formidable than any other kind now known. By the concurrent action of Congress and the War Department the service of our submarine mines has been devolved upon the engineer troops; and now all engineer officers when assigned to the Corps, and officers of other branches of the service who may desire to take the course, receive full instruction in the details of

the system at the Engineer School of Application at Willet's Point.

Space is lacking to consider, except in a very general manner, the engineering details of the coast batteries now under construction to receive our modern armament. Magazine accommodation for 200 rounds, of which at least 100 rounds will be stored in the immediate vicinity of the pieces, is provided for all high-power guns. Shells will be stored loaded, but without the fuses, and the propelling charges will be kept in service cartridge bags protected by waterproof zinc cases. No handling of loose powder will thus be needed in the magazines. This condition is demanded by reason of the immense amounts of powder required by modern high-power guns. Thus for 200 rounds the amount called for by an 8-inch gun is 13 tons; by a 10-inch gun, 25 tons; and by a 12 inch gun, 45 tons.

As no funds have thus far been made available for the construction of armored land defenses, no definite decision as to the kind of armor to be adopted has been made. The matter is held in reserve to benefit by the latest developments. It is hardly probable, however, that the immense expense of the new types of ship armor will be demanded, especially as on land weight is rather an advantage than otherwise.

The batteries under construction are protected by earth and concrete. With a view to deflecting the projectiles, and to reducing cost, as many boulders or large masses of rock are incorporated in the latter as is consistent with the formation of a solid monolith. The rule has been adopted that the magazine cover on any probable path of a projectile fired from the larger high-power guns should be 40 feet of such concrete and 10 feet of sand, or their equivalents—2 feet of sand being regarded as the equivalent of 1 foot of concrete. Near the surface the full thickness of concrete is used, and its exterior face is given a slope of 1 on 1 for the purpose of deflecting the shot. For parapets a breast-height wall of 25 feet of concrete with exterior covering of earth sufficient to fill out to the plane of magazine cover is adopted. This total protection corresponds to a thickness of about 70 feet of sand.

Magazines and covered passages in all batteries will be lighted by electricity, supplied probably by storage batteries, or dynamos driven by petroleum engines where other power is not at hand. Provision for electric range lights for sweeping mined fields is also contemplated.

The new system of coast defense is fairly inaugurated, and will be prosecuted as rapidly as Congress provides the funds. Mortar batteries are now under construction at both entrances to New York Harbor, at Boston, and at San Francisco. A gun-lift battery for two 12-inch guns has been constructed and successfully tested at Sandy Hook. Disappearing gun batteries are completed or under construction at Portland, Boston, both entrances to New York Harbor, Washington, Hampton Roads, and San Francisco. Mining casemates are built with their cable galleries at all the most important harbors, and a fair supply of the mines and their accessories are in readiness for use. Estimates were submitted for continuing the work at the ports above named, and at Charleston, Savannah, and New Orleans, but failed to receive favorable action at the last session of Congress. The needed armament is now in a much more advanced condition than are the emplacements to receive it; and the prospect is that a satisfactory pattern of disappearing carriage for 8-inch and 10-inch guns will be selected before the close of the present year. The carriage for mortars, and that for 12-inch guns mounted on gun-lift batteries, as well as those of the non-disappearing type, have been adopted. In fine, liberal appropriations are all that are now needed to place the coast rapidly in a satisfactory condition of defense.

THE OUTLINES OF A SOUTH AMERICAN REVOLUTION.

BY LIEUT. JAMES H. SEARS, U. S. NAVY.

THE minor war a short time since in Chili which caused a passing interest in these United States, seems in a fair way of being forgotten, at least it appears hardly to have possessed sufficient interest to have induced any one to set down its events and incidental lessons in any other form than in reports and letters to newspapers during its continuance. This is the more to be regretted as the course of the war, if closely and carefully examined, is far from barren in incidents which have a real value to day, not only for the military or naval man but for the civilian, who as well is not exempt from the evils of war. The present writer having been in Chili throughout the war, and having in his possession information, meagre it is true, but sufficient to enable him to give a somewhat continuous narrative, trusts that such a narrative will not be found devoid of interest, more especially as it may tend to correct some misconceptions that arose and which he has not elsewhere seen corrected.

In 1891 a remarkable work appeared in England written by a distinguished admiral, in which the operations of naval warfare for some centuries back were made the subject of a critical examination, especial attention being given to naval warfare where its operations touched the coast line, where the military stretches forth its hand to its more retiring sister, the navy. At the end of the volume the author summed the result of his investigations in these words: "I think, therefore, that these chapters leave us under the inference that certain conditions—command of the sea, sufficient and well handled land forces, landings either away from the batteries or after their fire has been temporarily silenced, proper appliances and small vessels—have always been necessary to secure the success of territorial attack, and that there is at least nothing in recent times, to show that the rule has in any way changed." What interest there may be in the Chilian war should not suffer from the fact that, waged as it was under modern conditions, with weapons of the highest modern development, the above paragraph receives a new confirma-

tion of its historical accuracy from the events of that war. In other words, the officer or civilian with a working knowledge of the course and events of previous maritime wars, has in his hands a rule which intelligently used is a not unsafe guide, and in so far as he better equipped than his brother who relies solely upon his more or less perfect familiarity with the technique and tactics of weapons. The question as to the value to the professional soldier or sailor of a study of previous campaigns is an old one and is generally resolved in favor of such study. So far as the agreement between historical deductions and the course of the Chilian war is concerned, Admiral Colomb might have added,—and there is something in recent times to show that the rule has not changed. In its general aspect then, the lesson to be derived from the war is probably a valuable one, but concerning its particular events the reader will form his own opinion.

The armed forces parties to the conflict were numerically small, the vessels were few in number, and the actual combats by land and sea were not characterized by tactical effects and combinations of high interest. The chiefest interest lay in the movements of the armed forces preceding their contact, in other words, in the strategic game. Not being a soldier I can have little to say concerning the tactics displayed in the handling of the land forces, but it is permitted to any one to judge from known data the effects a given force will have when applied in a particular manner, and in such a respect the value of a study of a war is quite independent of the magnitude of the forces opposed; it is even possible that minor wars wherein the operations are necessarily not surrounded with a horde of other and conflicting circumstances which tend to divert the interest, have a value for the student peculiarly their own.

It will be recalled that the Chilian navy revolted almost as a unit against the existing government in January of 1891, and this action of the navy being unaccompanied by popular uprisings which I suspect were anticipated, the army also remaining loyal, gives to this revolt an unique historical standing. Naval officers have risen in revolt and have carried their vessels with them, but there has been back of them the authorization of a land force or of an armed portion of the populace. This action of the navy had for a basis the following note:

VALPARAISO, *January 6, 1891.*

The President of the Republic, in a manifesto addressed to

the nation, has declared that as he cannot govern in accord with Congress, as is ordained in the constitution, and as all his predecessors have done, he has resolved to maintain the land and sea forces without legislative authority and to defray the public expenditure without the passage of the budget.

In this manner and for the first time in Chili, the President of the Republic has placed himself outside of the constitutional regimen, he has renounced the lawful authority with which he was invested, and he has aspired to assume a personal and arbitrary power which has no other origin but his own will nor any other limits but those that circumstances may assign him.

In so grave an emergency it belongs to Congress to take upon itself the defense of the constitution and the adoption of such measures as circumstances may require for the reestablishment of its power. In the discharge of this august mission, Congress ought to count upon the efficacious assistance of the land and sea forces, because they exist only by virtue of the constitution, and it is not possible that they would care to forfeit their legal existence by placing themselves at the disposal of a dictatorial regimen springing from purely private desires of the President of the republic. Fifty-seven years of uninterrupted constitutional existence and a lengthened tradition of sacrifices made and glories reaped in the service of the nation, point out to the army and navy of the Republic the path of duty, and compel them to resist, as opposed to their own honor, all attempts that may be projected or executed against the charter which is the foundation of the national institutions and from which the public powers derive their origin.

Congress, in fulfilment of duties imposed upon it by the actual situation, has adopted the resolutions which are to be found in the document annexed to this communication, and at the same time it has conferred upon the undersigned the necessary authority to present themselves to the navy and to order it to coöperate in its own sphere of action to the early reestablishment of the constitutional regimen.

In virtue whereof the undersigned have resolved that there be organized a naval division, to make the Republic comprehend that the navy obeys the constitution and, therefore, that it is indispensable that the annual law authorizing its existence be passed without delay.

The commander of this division will be Capt. Jorje Montt,

and the undersigned will remain on board to attend to the development that this movement in defense of the constitution of the Republic may take.

WALDO SILVA,

Vice-President of the Senate.

RAMON BARROS LUCO,

President of the Chamber of Deputies.

To Capt. JORJE MONTT and to the

COMMANDERS AND OFFICERS OF THE NAVY.

The signers of this note accompanied the vessels when they left Valparaiso on the following day, January 7th.

It became at once necessary for neutrals to determine for themselves the status of these vessels, and the question was settled by leaving the vessels to determine by their action towards neutrals how they should be regarded.

The revolt having become an accomplished fact without popular uprisings, the army and military resources remaining with the government, the leaders of the revolt were confronted with a difficult problem, as, lacking money, standing and resources of all kinds, it was a mere unsupported floating force which they wielded. It was of course open to the fleet to bombard the rich city of Valparaiso, which lies close to the water's edge in a position extremely favorable for such an operation. There was provocation for such action also in the fact that the boats of the fleet had been fired upon by the policias, and that a Krupp coast defense gun had hulled with fatal results a vessel of which the Chilian people were extremely proud. The harbor defenses were not in good condition, and the result could only have been disastrous to the city. In view of the fact that a fresh school of naval writers clamors for future naval wars of destruction of property, public and private, by the fleets mistresses of the sea, the situation is interesting. It is proper to inquire what the results might have been, in case the fleet had retaliated upon the city. On one side some buildings wrecked, some non-combatants killed, the coast batteries silenced perhaps for the time, and the populace enraged; on the other side, some damaged vessels, and all with exhausted magazines, and by that so much worse off than before, and certainly no nearer the end. It appears to me that such considerations must be present to every fleet on a hostile coast acting singly, before a warfare of destruction is entered upon by it.

The bombardment did not take place and the fleet proceeded rightly to work. Vessels were intercepted, from which supplies of all kinds were taken, coal, arms, ammunition and provisions, for which receipts in every case were given. Raiding expeditions along the coast, conducted with rare discretion and moderation, gradually increased the resources of the fleet, money, recruits and munitions being always requisitioned where found. The prime necessity was a base, the one first occupied, Quinteros bay, but fifteen miles north from Valparaiso, not being suitable because of its proximity to that place, and the impossibility of making full use of it without troops. The riches, location and comparative military weakness of the nitrate provinces indicated them as the proper field for enterprise, and the first actual theatre of war was then in those provinces; and in the operations which took place there the fleet in command of the sea is seen fulfilling completely its rôle, in simply supporting in every manner possible the attempts of the land forces which every day saw considerably augmented.

The government, anticipating the revolt, had increased the garrisons in the northern provinces, from which so much of the reserves of Chili is drawn, but it seems that, if it, the government, had realized the extent of the disaffection existing amongst the people, or the tenacity and ability of the leaders of the revolt, it should have made no attempt to hold these provinces, for, owing to the nature of the country, they were completely isolated, and their garrisons could only be reinforced by sea. Such being the case, it was impossible to offer them any aid in the face of the fleet, and their subjugation was only a matter of time. The justification for the resistance offered lies in the fact that the government looked, in the time gained by resistance, to the acquisition of vessels, and perhaps to the commission of overt acts by the squadron, which would have introduced new factors into the problem. None of these things transpired, however, and such resistance as was made became the cause of useless bloodshed, the holding out powers of the garrisons being simply limited to their powers of endurance. The defending troops were distributed in three detachments, one about Pisagua and Iquique; another in the neighborhood of Antofogasta, and the third near Tacna and Arico. The detachment in the province of Tarapaca, on the line of the nitrate railroad, was overwhelmed before either of the other detachments could be brought to its relief. The

southern detachment under Col. Comus was in turn threatened and retreated across the Andes. The northern detachment under Colonels Arrate and Gana retreated into Peru.

Once established in the north, the leaders set to work to establish a form of government, and this being established, there then existed, practically, two nations with a contiguous land frontier and lengthy coterminous sea frontiers in a state of war with one another, though not in an acknowledged state of belligerency. The irregularity in the national conditions of the two parties was very marked, one of the belligerents having an army and but the skeleton of a navy; the other having a navy and but the skeleton of an army. One party, from the fertility of its territory, its manufactures, its war resources and its recognized government, had seemingly everything in its favor,—it lacked only vessels, through the instrumentality of which alone could it hope to assume the offensive so necessary to the resumption of its full state. The other party depended solely upon the resources flowing from its mineral wealth, lacked all the necessities of life, and had but its fleet as its single offensive arm. This fleet, however, and the desert of Atacama were the guaranties that the government forces should not molest the northern provinces. Why then in this positive security were not naval operations undertaken against the weakly fortified ports of importance in the heart of the Republic? The answer can only be that nothing was to be gained by such operations at all commensurate with the risks involved, and this has been and always will be the most weighty factor when such operations are under consideration; and yet, the lapse of time was dangerous to the cause of revolution. The government had the money or the credit necessary to buy ships, and the revolutionists were recognized throughout by only one power, Bolivia. They rightly determined, however, to delay until they were in a position, so far as troops were concerned, to make a powerful impression upon the enemy; in other words, properly to utilize the command of the sea instead of frittering it away in attempts which were sure to stop short of being effective.

The arrival of two small but remarkably efficient torpedo cruisers in April and the successful attempts of the government to secure them, besides furnishing some exciting incidents seemingly turned the scale a little against the revolution, the conduct of which thus far had been irreproachable. Expeditions had been undertaken to the southward along the coast, the undefended

towns were visited, and the army was augmented and brought to a considerable state of enthusiasm and efficiency.

The next contact of the hostile forces occurred at Caldera, to which point the revolution had unopposed pushed its domain. The story of the sinking of the *Blanco Encalada*, famous for its fight with the *Huascar*, is a familiar one and will not be dwelt upon. Lying in an open harbor, having taken not much more than peace precautions, within 300 miles of two of the most efficient vessels in the world especially equipped for his destruction, the commander of the *Blanco* could have felt little surprise at the result. To point the lesson if there be any, it is necessary to suggest what might have been done. Not having the torpedo netting which, in the haste attendant upon the culminating events that determined the revolution, had been left upon the arsenal pier in Valparaiso, it was at least incumbent that the vessel should have been underway in the presence of the very actual danger which should have been well understood. It has been said that the light at the entrance to the harbor had not even been suppressed.

In case the commander chose to remain within the headlands, moored with a slip rope (which was the case), a moving with limited motion, he should have ordered a picket patrol, and half his crew should in any case have been fully alert. The commonest precaution in such event, that of providing or improvising a boom defense, should not have been neglected. The tactics pursued by the torpedo cruisers appear to have been well-nigh perfect. If, in addition to their having been torpedo gunboats they had been designed for ramming, it seems as though the work could have been done more surely, in less time and with less risk than was the case. Five torpedos were sent at the *Blanco*, only one, the last one, scoring, this being the second one discharged from the rear vessel and from a broadside above water tube. The two little vessels were under fire subsequent to the first torpedo discharge from the stern tube of the leading vessel. It is fairly certain that the lookout on the *Blanco* was not aware of the danger until the time of that discharge, or the moment immediately preceding it, which is quite inexcusable, for, whatever the condition of the night, a few picket boats would have given the alarm. The fact that the leading vessel was not once hit by fire from the *Blanco*, although she lay close to her long enough to discharge three torpedoes in succession, is quite conclusive as to this point. The trajectory of the torpedo is at best uncertain, especially if fired in

broadside from a vessel in motion. If the discharge is made from the position of the conning tower forward or aft, another element of uncertainty is introduced, the attention of the commander being divided at a critical moment. If the ram had been the weapon, Moraga, from the position in which his vessel was first discovered, not much more than 100 yards from the *Blanco*, could have made directly for the quarter of the ironclad, and a net obstruction, had there been one, could not have stopped him though it would have stopped a torpedo. One of the differences between the three weapons, the gun, ram and torpedo, lies in the varying distances from which they are applied, and in the relative interposition of the personality of the commanding officer in the use of each. All three in a sense are projectiles, the vessel in the case of the ram being itself the projectile, which the commander at the helm, the responsible head, conducts, unhampered by other fettering conditions, to its point of application.

This is not an argument for any exclusive use of the ram, it is simply a statement of the writer's belief that vessels of all classes should be fitted for ramming, and ramming of a kind that will not leave the attacking vessel as much out of a fight as the vessel attacked,—a recent disaster may be recalled as a case in point. It does not seem well that there should be no other weapon, for the ram pure and simple, subjected to a heavy rapid fire without power to reply, may find itself stopped short of the point of application where the possession of a few Whiteheads with a range of 800 yards would be well appreciated. A stem torpedo, being equally under the control of the commander, may be regarded as a ram applied at a distance. Some other hints may be gathered from this *Blanco* incident, for a weakly armed, perfectly vulnerable and clumsy single screw transport of much less speed than either of the two torpedo vessels, fought them both on the same morning in the open sea for over an hour without suffering any serious damage. The result of this action is reassuring as to the question of the ability of ocean steamers to take upon themselves something of their own defense in time of war in case they are outfooted. In fact the improvised auxiliary navies on both sides throughout the war demonstrated their extreme value. One of the torpedo cruisers was quite seriously disabled in this affair, and if the fight had not have been interrupted by the unexpected appearance of the *Warspite* on the horizon, Moraga taking the English vessel for an enemy, the *Aconcagua*, well handled and

bravely fought as she was, might have rendered a still better account for her morning's work. Another point worthy of notice is that a one-gun, perfectly open battery on the north shore of Caldera harbor drove the torpedo boats off as day was breaking, when they returned previous to the *Aconcagua* affair to reconnoitre the damage they had inflicted. They of course had no object in engaging this battery, but one gun seems to have been sufficient to guarantee that about all the damage that might be inflicted in such an engagement would not accrue entirely to the battery. On both sides during the war the vessels were cautious to timidity in regard to exposing themselves to the fire of the most inefficient shore batteries, and apart from the hazard little was to be gained from such exposure. I am convinced that the lightest of those defensive works will suffice to preserve harbors from the raiding attacks of cruisers.

Subsequent to the brilliant achievements of the torpedo cruisers in sinking the *Blanco* they accomplished little or nothing to add to their prestige, and yet they were of extreme use and performed wonders in the way of transport and convoy duty. The effect which their presence on the coast had upon the vessels of the fleet is an indication of the great value torpedo boats are sure to have in the matter of coast defense; for from the sinking of the *Blanco Encalada* to the capture of the *Lynch* on the last day of the war, there was no more rest for the vessels or crews of the revolutionary fleet; and without their striking another blow the action of the fleet was as much hampered through the moral effect of their presence as if the government had suddenly acquired a navy. Imagine the effect upon an enemy's squadron based at any point upon our own coast,—Vineyard Sound, Gardiner's Bay or where you will,—if we are known to possess as we should a horde of efficient torpedo boats.

On two other occasions only does it appear that these vessels attempted to use their torpedoes, and the reports in these instances lack confirmation. The vessels, however, manœuvred on several occasions by daylight in the presence of the fleet with perfect impunity. Their speed enabled them to run up and down the coast at will; to approach and annoy the fleet with impunity, and to enter the undefended harbors within a few miles of the centre of the revolution. Their coal capacity permitted them to infest the whole extent of the lengthy coast line, and their superiority in this respect over mere torpedo boats was very marked,

the latter being tied to manœuvring inside a very limited steaming radius. In the absence of torpedo depot ships of great power and capacity, I cannot see that torpedo boats of limited size are suited for other operations than those incident to an effective coast defense. Such boats can move in and out of blockaded ports at will, under cover of darkness or under the land in the day time, and be always ready to take advantage of the slightest neglect on the part of the attack. It was a matter of much adverse comment that no serious attempt was made by either cruiser upon the vessels of the revolutionary squadron during the months when they nightly put to sea and laid outside their ports. Night after night every circumstance was favorable to the success of such an undertaking. The *Huascar* and the *Almirante Cochrane* especially offered tempting targets. From their size and the thick black smoke produced from their coal they could be seen from a considerable distance under the ordinary atmospheric conditions prevailing in that latitude, while the smaller torpedo vessels with judicious stoking were quite invisible at distances exceeding a hundred yards. Ignorance of the habits of the vessels was not the reason for the absence of such attempts, for their movements were at that time known to all. The reason on the contrary is to be sought in the caution of the president of the republic, and in the belief held that delay would bring reinforcements in the shape of other vessels at that time under construction in foreign countries. Without this reason the caution was misplaced, for the situation was exactly one where desperate risks should have been incurred, without which the naval inferiority of the government was but impotence.

Some of the incidents of the French naval manœuvres of the present year go far to show that the chances for finding and destroying one or more vessels of the Chilian fleet were greatly in favor of the torpedo cruisers, situated as they were. Upon one occasion the French commander-in-chief, wishing to test whether or not torpedo boats could locate vessels in the open sea at night in the face of scouts thrown out, sent a squadron in the offing off Hyères, leaving the scouts along shore. The torpedo boats were grouped at two points, and in the evening they received from the semaphores the latest information as to the last seen of the squadron. The admiral extinguished all lights and kept his squadron in motion on various courses. The scouts discovered and broke up one of the torpedo boat's nests. The boats from

the other station got out and gained touch with the squadron by spreading over a large area. They were discovered (at what distance is not stated) but the story goes that the fire opened upon them was very much at random and that it took no account of friendly vessels, and that undoubtedly one or more of the vessels in actual warfare would have been torpedoed.

The effect produced by the news of the *Blanco* disaster was electrical in the north, and an immediate advance upon Valparaiso with all the resources of the revolutionists by sea and land was at once demanded and even ordered.

Better counsels prevailed, however, and there can be no possible doubt that such precipitation would have been fatal to the cause. Lacking still troops, arms, munitions, clothing, stores, organization,—everything in fact which goes to make a military force,—the scheme was visionary. Delay was absolutely essential in order to establish even an equality with the southern army. Now was the opportunity for the torpedo cruisers, only one more success and it is possible that the revolution would have collapsed; with the *Blanco* on the bottom, such sympathy as had been extended to the cause of revolution had received a check. If the *Cochrane* and the historic *Huascar*, or either of them, had met with the fate of the *Blanco*, the sympathy so necessary to such a cause would have been still further withdrawn under such a demonstration of force by the government, and it is within the range of possibility that the second blow would have been deadly.

At this period came the recognition by Bolivia, not much to be sure, but it meant something and was encouraging and much was made of it. The troops in the north now numbered perhaps 3000 men. Those of the government, if the armed policias are included, fully 40,000 men, distributed between Coquimbo, Valparaiso, and Concepcion on the coast and in Santiago, the capital, 80 miles by rail from Valparaiso. The only active hostilities characterizing this period of preparation were the cross raiding operations carried on by sea by the vessels of the opposing parties, the ports lying between Coquimbo and Iquique being in turn subjected to the demands of the representatives of either. Neutral interests suffered severely and many interesting questions arose touching their rights and reciprocal duties which are beyond the scope of this paper. The demands of the government raiders took the form of money extortions, those of the

revolutionists were more comprehensive and included men and horses. The insufficiency of mere decrees to interfere with commerce and supplies was amply shown, and the early efforts of the President to isolate the revolutionists met with failure. If the trade was cut off with the south it augmented from the north. Vessels that entered the southern ports, those in government control, were refused clearances for any of the ports of the north, and finally were refused clearances for Peruvian ports on the ground that they or their cargoes found their way back to the nitrate ports. The presidential decrees were modified under pressure, and when not modified were occasionally evaded. The nitrates were as good as gold, and prices during the entire war, while high, were never excessive for any class of articles in the nitrate ports. The currency naturally suffered some depreciation, and most singular expedients were resorted to for the purpose of maintaining a circulating currency. Rubber and pasteboard discs issued by reputable firms circulated freely and were generally received.

The *Itata* affair, in the excited state of the revolutionists came upon them in the nature of a calamity, for her arrival and the distribution of her cargo of munitions was to have signalled important movements. It is more than possible however that the non-delivery of her cargo told heavily in favor of the revolution in the end. The troops in number and discipline fell far short at that time of the lowest limit which could rationally be set. The *Itata's* cargo would have placed them in the mere matter of arms and ammunition on an equality with the enemy, no more, whereas in the end their superiority in this respect was most marked and told heavily for them. What was of far greater moment was that the delay permitted Col. Körner to develop to the fullest possible extent the organization, discipline, and consequently the efficiency of both troops and officers. The task was one for which Col. Körner had peculiar qualifications both by nature and by training. For many years an officer of a highly trained European army, serving it is said with distinction on the General Staff of that army, he was recommended to the Chilean government as especially qualified to fill the position of Commandant of the Military School in Santiago. His sympathies going with the revolution, he made his way north subsequent to the establishment of the Junta and offered his services. He was made chief of staff and set to work with great energy

to establish order and discipline among the new troops where previously there had been considerable misdirected effort. The officers received constant instruction, modern ideas and tactics inspired their zeal, and to all innovations the Chilians' rank and file proved very susceptible. The older officers caught later, as was to be expected, the infection, and in the end all fell under the same spell of enthusiasm. Under these improved conditions, and with the army largely reinforced, the arrival later of another transport, the *Maipo*, was indeed a godsend. She brought Mannlicher rifles and ammunition in abundance, Nordenfeldt guns, Gardner guns, uniforms and blankets which had been transferred to her from another steamer it was said in the neighborhood of the Falkland Islands. Desertions ceased and the nitrate workmen who had been permitted to remain at their works were recalled.

The commercial blockade of any or all of the ports of the south, if it could have been tolerated by neutrals who had not acknowledged the government of the revolutionists or of the Junta, could scarcely have been more effective. Considering the character of the various vessels on either side it may also be said that a military blockade of the government vessels would not have been effective, and that with the sluggish nature of the vessels of the revolutionary squadron an attempt to observe the *Imperial*, *Lynch* and *Condell* would have been futile.

The revolutionary army having reached the minimum of strength deemed necessary for the descent upon the southern coast, the season of gales approaching and all delay telling in a political sense against the Junta and for the president, it became the duty now of the leaders to frame definitely their plans for the ensuing campaign. The military situation was as follows: While the various bodies of the revolutionists were scattered in detachments along the coast line of their territory, their forces may be considered to have been concentrated, owing to the mobility conferred upon them by the transport service and their freedom from danger of attack. The southern point occupied by them at this time was Huasco. The government troops were divided between four points,—Coquimbo, Valparaiso, Santiago and Concepcion á Talcahuano, but as Valparaiso, Santiago and Talcahuano were in quick and ready rail communication, these three detachments, so long as the communication remained good, may be considered as one. In and about Coquimbo and La Serena to the north, a di-

vision numerically somewhat inferior to the total of the revolutionary forces was isolated, there being no rail communication, the country being exceedingly difficult and the sea dangerous. This division was a picked force consisting of a proper proportion of the various arms of the service, making it a complete though small army.

It was believed with reason to be able to cope with the invading force in case the province of Coquimbo should become the theatre of operations, and in case of disaster it had a line of retreat towards the capital.

Collectively the forces resting on the three other points were far more numerous than those of the revolutionists, and while communications were maintained, each point may be said to have been completely covered. The question then for the grave consideration of the revolutionary leaders concerning the projected movement, was the selection of the landing point and the future objective, in view of the known dispositions and strength of the enemy's forces. The question was so far simpler than in some other territorial descents by sea, that the possession of Valparaiso or Santiago meant the immediate success of the revolution, each point being a decisive one. Blows aimed at other points would, if successful, have been merely introductory to the serious business of the war. The councils of the leaders proved to be divided into two parties, one favoring a descent upon Coquimbo by sea and land, the other a descent upon Valparaiso, although three lines of operations were open to them, the third being directed upon Talcahuano. While these things were still in the air a skirmish took place at a town called Vallenar, south from Huasco. The first brigade of the revolutionary army had been landed at Huasco for the purpose of establishing a base at that point. The general commanding the government troops in the province of Coquimbo, anticipating an attack in force by land from Huasco, had thrown forward a detachment of cavalry in reconnaissance in that direction. This detachment came in contact at Vallenar with the outposts of the first brigade thrown out from Huasco. This skirmish and another slight one at Higneve, in the same neighborhood, while productive of no results, defined accurately the line now drawn between the land forces,—the territory of the revolution had been pushed in dangerous proximity to that held by the government armed forces. These skirmishes and the presence of troops so close to Coquimbo, induced the Santiago

authorities to throw 2000 more men into that place, bringing the total number in Carvallo's command to not far from 9000 men.

The revolutionary forces were continually increasing in numbers until by the end of July 10,000 men were on hand for the southern movement, with a considerable reserve to remain in the north for garrison duty. The question as to the landing point became still more pressing, for on the 18th of September the new president would assume office, and with his accession such concessions might be made as would remove the causes perhaps for further hostilities, especially so far as those personal to President Balmaceda, and not personal to the president-elect were concerned.

In selecting the objective the direct sea attack upon Valparaíso was properly put out of the question, and the direct descent upon Coquimbo, which had no fortifications worthy the name, was scarcely contemplated though advocated. The conquest of the province, if assumed certain to follow, would have required time in the presence of the fine and loyal division there stationed, and its attempt would surely have resulted in heavy losses to the attack without being decisive. Its possession was not really of sufficient importance to Balmaceda to have justified the attempt to hold it except that the necessary division of the forces could be made and yet permit, which was the case, the retention at the decisive points of a force superior to the enemy. The conquest of Coquimbo then would have been but a step towards the end sought for and would have involved heavy risks not justified by its importance, besides, much valuable time would have been wasted. In a less degree the same considerations held as regards the descent upon any other point of the coast interposing in itself a secondary objective.

Communications received from the capital and neighboring places from revolutionary committees assured the revolutionists that, coincident with their descent near Valparaíso, bands of mountaineers would arise, and would destroy the railroad bridges, obstruct the tunnels, cut the telegraphs and in every possible manner endeavor to prevent the junction of the detachments of the government's troops beyond striking distance of the landing force, and Valparaíso was selected as the objective, that is, it was decided that the landing should take place near that city. Viewed in the light of subsequent events no alternative seems worthy to have been considered.

The slight feint near Coquimbo had been sufficient to cause the weakening of the central forces by 2000 picked troops, and yet the government leaders, if confident of their ability and of the loyalty of their troops, had little military reason to dread the result. Their position appears to have been an extremely strong one, for, so long as they could maintain their communications and their means for acquiring instant and certain information of the landing point of the enemy, nothing would seem to interfere with their ability to confront the invader, in case the landing were made at any point with the exception of Coquimbo, with a greatly superior force in numbers. It further appears almost positive that a reverse administered to the invading force would have been fatal to the revolution, if similar situations are recalled,—the critical position for instance of Wellington before the battle of Vimiera, or that of the allies in the Crimea before the battle of the Alma. In case of a reverse there would have been little prospect of preserving more than a remnant of the invaders, and it is hardly possible, considering the great efforts put forth to recruit the first army, that another army could have been put in the field. At any rate all that the revolution was to have gained by beginning operations before the 18th of September, before the possible, even probable, increase in the government sea force, and before the Coquimbo division could have been brought by land (a march of 20 or 30 days) to the support of the central forces, would have been lost. The desperate nature of the undertaking would seem to be sufficiently apparent.

The chiefs of staff,—Körner for the army and Molinas for the navy,—arranged the programme of the expedition with consummate ability, every seeming contingency possible being provided for; and their respective written orders covering the details of the movement would serve as models for any similar expedition.

The forces embarked in 17 vessels divided into three squadrons and sailed by squadron over prearranged routes, and were united to the westward of the Bay of Quinteros. This bay had been reconnoitred previously for the detection of submarine mines or torpedoes, and the *Esmeralda*, a cruiser similar to our *Charleston*, had been sent ahead to signal to the revolutionary sympathizers the fact of the landing by firing three guns in front of Valparaiso.

It is possible, though it has nowhere appeared, that her duty was more comprehensive and included a look to see what the

torpedo cruisers were up to. At any rate this was a precaution that should have been taken.

It is certain that Balmaceda had become convinced that the landing would be made in the centre of the republic, and that the commander of the Coquimbo Division was equally certain that Coquimbo would be the point, but Balmaceda took every precaution on the basis of a landing at either point. If his measures as dictated by himself had been carried out strictly, it is more than possible that the closing scenes of the little war would have offered something more worthy the attention of the military student than the series of disgraceful routs to be recorded.

The selected point for the landing was singularly well adapted to such an operation, the water area offering the characteristics of space, depth and smoothness so essential to the rapid and easy disembarkation of a probably sea-sick army, with its horses, artillery, ammunition and other stores. The beach, in the form of a crescent, was easily accessible for the troops, and the surrounding country offered no secure points from which the landing could be opposed. If the location of the actual landing place had been south of the Aconcagua River which lay across the path of the expedition, nothing more could have been desired. Fords, however, existed near the mouth of the river, so near that the vessels could support with their fire the fording of the river, yet the passage was still difficult.

The expected coöperation of the Montoneros proved abortive, for some of the young members, anticipating the signal, were surprised at a meeting place near Santiago, and were summarily dealt with. The event has become known as the massacre of Los Cañas, the participants in which are, with few exceptions I believe, the only adherents of the government now refused amnesty. This event operated however as a powerful deterrent to such enterprises and so far simplified the task of the defenders, who thenceforward took more energetic measures for the preservation of communications.

The landing took place as intended and without incident on the 20th August, but was however a little behind time, and the delay modified considerably the character of the early operations. It had been planned to strike directly for the railroad after landing, crossing the river at once. This was found to be an impossibility and the river was not crossed until the following day, and then in the presence of the enemy. It was also made apparent to the

leaders that the coöperation of the Montoneros had failed them, for the rail was found in operation as well as the telegraph, and it was to be assumed that the junction of the Santiago with the Valparaiso division would be an accomplished fact before the revolutionists could strike a blow. Reconnaissance parties were detached and the little army took up its march along the sea-coast towards the river. The original plan contemplated the sending inland to the left a sufficient detachment to hold in check the Santiago division, while the main body dealt with the Valparaiso division.

The fact of the landing was immediately telegraphed to all divisions of the government army and the concentration began, the troops in and about Valparaiso and Viña del Mar, a fashionable suburb, being thrown forward to meet and check the advance. The Concepcion and Santiago divisions made large detachments which were advanced by rail towards Valparaiso. Gen. Carvallo, commanding the Coquimbo division, asked by telegraph permission to send troops overland from Coquimbo, which was refused him, the leaders with their numerical superiority feeling able to cope with the situation, a violation of the maxim in regard to underrating an enemy. The Valparaiso division or a large portion of it was enabled to reach the line of the Aconcagua in advance of the revolutionists but before the Santiago troops had come up, a small portion of whom under General Barbosa succeeded in reaching the river before the battle that took place there.

The fords near the mouth of the Aconcagua were situated at some little distance apart, and the valley of the river was broad enough to enable the government troops to keep the enemy under fire for a considerable period of time, and the heights on the southern bank were especially favorable to a good defense. The hills were intersected with ravines which, while interfering with the lateral movements of the defenders, by judicious dispositions could be made to serve at the same time as obstacles to the attack.

General Alcérrecá in his dispositions for defense has been accused of unduly neglecting his left which overlooked the ford nearest the mouth of the river, as this neglect permitted a strong flank attack to be delivered upon him by that ford. Those who thus accuse him do not apparently take into consideration the part the guns of the fleet actually took in the fight, nor the part

taken by a naval battalion landed in his rear. The inability of troops to remain under the fire of ships when openly exposed to it has always been very marked.

In a conference held some days before the battle of Concon, the president gave it as his opinion that so soon as news of the landing had been received, be it in Papudo, Quinteros or San Antonio, the three most likely places on that section of the coast, the enemy should be met only with a greatly superior force, and he placed, it is stated, 14,000 troops as the minimum. This number it was quite practicable easily to oppose to the advance, if the impatience of the generals, falsely, as it proved, imbued with contempt for the enemy, could be restrained. He rightly estimated as well that the enemy's forces amounted to upwards of 9000. This opinion of the president's was not well received by Barbosa, but subsequent to the landing and previous to the first battle the general was again warned not to engage until strong enough to make success certain.

The detachment of the Valparaiso division sent forward reached the river, as before stated, previous to the arrival of the detachment from the Santiago division, but Barbosa coming up in the morning raised the total number of troops at the river to not far from 7000 men.

Körner attacked the left wing by the lower ford, and while this part of the line was being reinforced, the right was attacked by an upper ford. The fleet and the naval battalion took part on the left and left rear, and the wings were broken, doubled back on each other, and the defeat, after a sanguinary fight, became a rout. All the artillery of the defense fell into Canto's hands, and from a statement of the chief of staff of the Santiago division it would appear that only about 2200 men returned to Valparaiso. The loss on the other side amounted to perhaps 500 men from all causes. It would appear that the government generals, in neglecting the president's instructions, had offered to Canto an opportunity to crush an important detachment of their army which he had ably seized.

It is possible that political considerations as well as over-confidence had been at work to induce them to give battle at the greatest possible distance from Valparaiso, and the river furnished the necessary features for a good defense, but it seems clearly apparent that a probable or possible success had been foregone for a desperate and hazardous chance.

The victors were exhausted with their night march and the hard day's fighting, and the ammunition not having come up from Quinteros they were unable to follow closely their advantage, but they pushed on south from the river until a suitable place was reached where they went into camp.

The leaders on the other side made good use of the breathing time thus allowed them, and rectified, so far as in them lay, the condition of things. Their defensive line was retired behind the creek which flowed by Viña del Mar, and rested upon the crest of the hills between that place and Valparaiso. The communications between the two places are by a wagon road and a railroad which pass close to the seashore, or by a wide detour inland. This line occupied the crests of the hills in a curve concave to Valparaiso and was very extended. Communication between its posts was feasible but very difficult.

On the morning of the 23d the revolutionists were in force on the hills north of the creek. The state of affairs in Santiago had become such after Concon that all the troops could not be withdrawn from that city to the front, confidence on the part of the leaders though loudly expressed being no longer felt; and while they were yet able to interpose between Valparaiso and the enemy 9000 or 10,000 men, indecision and uncertainty had replaced the former feeling of security in the minds of all. The president and his minister of war on the one side, impressed with the gravity of the situation, were divided in their opinions from the two Generals Barbosa and Alcérreca, veterans of the Chili-Peruvian war. No plans appear to have been contemplated at this time other than to get between the city and Canto's troops, yet it was given out that these same troops, flushed with victory, were being hemmed in or surrounded, and that it was only a question of time when they would be driven into the sea.

On the morning of the 23d, the rail and all the communications remaining intact and in possession of the government, the two armies, as stated, were facing each other across the creek. Canto's first plan had been to attack directly and to secure the entrance by the shore roads to Valparaiso, while the fleet was to coöperate in the attack. The front of the land attack, however, was commanded by the guns of a strong work on the coast, Fort Callao, and temporary cover had been thrown up for the field artillery, the government having definitely abandoned the offensive. The position seemed so strong to Canto that he did not deem it

advisable to attempt to break through, although the chances for success were about even. While the batteries and works on the sea front of Valparaiso were numerous and were now well equipped and manned, it would have been possible for the vessels of the fleet to have engaged those on the side nearest Viña at any desirable range, completely covering with their fire the line of advance of the attack while in comparative safety from the fire of several of the batteries. During some hours of the 23d a desultory artillery fire was maintained between the artillery of the land forces, and between the forts and some of the ships, with absolutely no results, but this action has sometimes been dignified with the title of the Battle of Viña del Mar.

Canto's troops, in spite of their victory and the resting spell, were yet not in the best of condition, the more severe climate of the south having told heavily upon them; and besides they were insufficiently provided with food, the lack of army transport having made the operation of maintaining the army away from the fleet a matter of great difficulty.

The direct combined attack upon Valparaiso being definitely abandoned, two lines of operations were now open to Canto, both involving a temporary suspension of communications with the fleet, and both hazardous if in the presence of a loyal and energetic defense well handled and in a country where the operations might be hampered by the actions of the peasantry. The result showed that Canto rightly estimated the factor confronting him and that he acted with great discretion and ability. One of the alternatives was to strike the railroad, obstruct it and destroy the telegraph, and by pushing ahead in forced marches, reach Santiago before the government troops. The capital would have fallen in that case without the firing of a shot. The other operation was to proceed by a flank march to the rear of Valparaiso, which would oblige the enemy to take a position less favorable and less capable of defense, while compelling him to face an enemy in front with his back to a hostile sea. The first plan required the greater time for its execution and, besides leaving an enemy in rear, involved a complete severance from the fleet. The character of the country was also very forbidding, and in leaving his base Canto incurred the risk of having his line of retreat cut off. In operating as he did eventually, following the second alternative, he continually approached a new line of communications with the fleet in leaving the old one, and

had an objective equally or more decisive, for it was the armed force of the government itself that he would strike. Celerity and secrecy were essential in order that he should not be forestalled in a position unfavorable to himself, and the line of march was clearly indicated by the nature of the surrounding country. The shore line of the harbor of Valparaiso is in the form of a crescent, with the ground rising directly and rapidly from the sea, ridges of hills extending on either side of the city down to the water and enclosing the city in a pocket. To the northward and eastward, the creek of Viña del Mar and its valley offered the opportunity to the railroad to get away from the coast to the interior. Back of the city and behind the hills overlooking it is a large plateau separated from the valley of the creek by a ridge of hills which is very difficult of passage except the valley is followed some distance inland and the plain reached from the southward and eastward in rear of the city. Nearly all roads to and from Valparaiso in every direction are united in this plain, and the operations which took place there would possibly have been of the same nature if the landing had been made to the south of the city, which I believe was at one time under consideration.

It was incumbent upon Canto, having made his determination, to deprive the enemy as far as possible of the opportunity to prepare a defense upon this ground. This object was not entirely accomplished, and would have perhaps been frustrated entirely but for dissensions and blunderings on the part of the government leaders.

Camp was broken from above Viña on the 24th, the railroad struck and cut at Cuchara, and Quilpue occupied on the same day, where the army was provided with sufficient food. This first move, apart from being a necessary preliminary to the flank march, was in the nature of a feint made to deceive the enemy and to draw him away from his strong position,—for Canto says in his report that he had not entirely resolved upon the nature of the flank march until he had arrived at Quilpue. For the first few days following this movement the government leaders were in the dark as to what it meant, and with the rail and telegraph cut, their weakness in the means for acquiring information became painfully apparent, and the bottom seemed to have dropped from their resources, yet “the enemy would soon be driven into the sea.”

After Concon the *Condell* and *Imperial* were despatched to Coquimbo and brought reinforcements, notably a fine cavalry brigade, to Laguna, but the distance of this point was too great, reckoned by marches, for it to reach the main body before the final catastrophe. If this move had been made, as well it might have been at the time of Carvallo's request, the government would have had the aid of perhaps the most efficient troops in the whole army. The vessels were unmolested in their work and no effort seems to have been made to observe them or intercept them.

The army remained at Quilpue until the morning of the 26th, then marched to Las Palmas and rested, resuming the march in the night. On the morning of the 27th the army was across the wagon road or turnpike between Valparaiso and Santiago, and it encamped at Las Cadenas. By, or before this time, the enemy was alive to the situation, and put forth prodigious efforts to interpose between Canto and the city in a favorable position. The whole line had to be withdrawn and the change of front made under most disadvantageous conditions, for the gulches and ravines all lay across their line of march. The movement however was successfully accomplished and a superb position occupied directly on the turnpike, or as it is called, the Casa-blanca road, on the hills back of the city and overlooking the plain. At this time the dissension among the leaders reached an acute stage, and the troops as well, insufficiently supplied, discouraged by reverse, and being at best of questionable loyalty, were hardly fit to encounter a victorious and certainly enthusiastic and well handled enemy. Several small detachments of troopers were captured by the revolutionists and incorporated into their ranks, and it is stated that some were incorporated without the formality of capture.

All day and night of the 27th the government troops were engaged in perfecting their defensive measures. The position occupied left little or nothing to be desired, but all the elements of disaster were present in their ranks. The ground was not very uneven, there were no points of the line which could not be readily and easily supported from the other points, and there existed no natural obstacles to the free and rapid supply of ammunition to the fighting line. On the right was an impassable gulch at right angles to the line, and the left flank was equally covered by a flanking gulch, though of a less

pronounced nature, yet there was no question of the impossibility of turning either flank. Commanding situations at intervals along the front furnished ideal sites for the numerous and modern field pieces, and there was no part of the front with the exception of a few transverse gulches which could not be swept by artillery fire, while at the base of the slopes on which the artillery was posted was a creek with marshy banks which could only have been an obstacle to the attack, a means for delaying it under a deadly fire.

Following now the account of Sr. Bañados Espinosa, then minister of war, who was now personally in command, the actual dispositions over this admirable ground were most faulty. The artillery alone appears to have been advantageously posted and with their infantry lines deployed in rear. The main body of the army, however, was grouped and huddled about the road in rear of the centre. A reserve in rear of the centre held ready to move to the support of any point seriously threatened, or a point accidentally weak, is, I believe, in consonance with good tactics; but when nearly the whole force is massed in such a manner as to place it beyond the power of its detachments to support the threatened point, no strength would seem to be derived from the disposition. If any efforts, other than preconceived deductions, were used by the government leaders to gain information of the enemy's dispositions for attack, there is no evidence to that effect.

Government officers subsequent to the ensuing battle complained bitterly regarding the measures taken, claiming that Barbosa clung to a mere belief that the attack would be over the road and on his centre, to the extent that he insisted upon disposing his forces as before stated, Bañados not exerting full authority; and that actually, after the beginning of the battle had indicated something of the enemy's tactics, he continued to reinforce the centre at the expense of the threatened points.

The artillery abandoned by the defeated troops at Concon had not been found serviceable by the captors, and their own artillery had suffered severely during the short but hard campaign. What remained to them in good condition however, was well placed on some low-lying hills in order to sweep the field and to respond to the opposing artillery.

It may not be amiss here to notice the complete change which had taken place in the relative positions of the two armies now

confronting each other. Canto's position, from having become precarious the moment he left the sea if his enemy had been equal to the occasion, had now become one of exceptional strength. He had changed his base to the country itself, and was in touch with the fleet by two lines; his enemy was in front of him, in a strong position it is true but with his back to ruin, and this enemy was in slightly inferior numbers and in weak temper.

The action commenced on the morning of the 28th and opened with the orthodox artillery contest. The two brigades of Canto's troops detailed for the attack gained ground to the front, securing what cover was possible, the third brigade being held in reserve.

I neglected to state that the government right, resting upon some high hills, was somewhat advanced beyond the remainder of the line, and it was this right which Canto had selected for the main attack believing that it could less readily be supported. The fight had barely begun, however, when the plan was necessarily changed. Whether the brigades in advancing found the ground to interfere, or whether Col. Körner discovered while advancing that the chances of success were better by directing the attack on the left where the ground was easier, cannot here be stated, but the reserve brigade under orders from Körner united with the first and attacked the left. The second brigade alone advanced to attack the right, and Canto ordered the cavalry to support the attack without waiting the result of Körner's movement. The attack then became one in full force of the entire front of the enemy. It succeeded, but it is hardly necessary to look further for tactical lessons of value from this battle. Both generals, Barbosa and Alcérreca, were killed, and the minister of war is an exile, and it is unlikely that accurate accounts will be had on either side.

The victorious army marched into Valparaiso in good order, and after a sharp skirmish between the head of the column and the *Lynch*, which vessel was lying at the arsenal pier, it succumbed to the infantry attack.

The *Condell* and *Imperial* were taken north by Moraga to Callao in Peru and turned over to the authorities.

Devoid of special interest as the war certainly was, it yet illustrated the permanence of the principles elucidated by Admiral Colomb as characteristic of such struggles. In some forms

of maritime war command of the sea may be the end and aim of all; in others the mistake should not be made of considering it everything. Not many changes of the pawns in this little war would have made the command of the sea a useless thing.

There is to be noticed a total absence throughout of contests between ships and fortifications, the fitful exchange of shots between them, on occasions, not being worthy of the name of contests; and it is difficult to see what objects could have been attained by such contests except under peculiar political conditions or where distinction only was sought. It remains to be shown that there was anything further in the power of the fleet to accomplish than what it did, though it does appear that some neglect or indifference was shown in not making more efforts to deal with the government vessels, which contributed such an actual and ever present menace.

On both sides it is safe to say that as much can be gathered in this singular struggle from the lost opportunities, naval and military, as from the able and skillful dealing with other opportunities and from the well-conceived, solid and brilliant expedition to the south.

NOTE.—Perhaps on the whole one of the most striking lessons of the war may be discovered in the single-minded effort displayed by the army and the navy, and the reader of history will not need to be reminded of the disastrous results following upon a lack of harmony between the two branches embarked. In certain classes of operations the military should certainly predominate, while in others it is unquestionably true that the naval commander should have full powers. The difference will readily suggest itself to the readers of this magazine. In this war the military properly predominated, but the chief of the Junta de Gobierno was in his proper person the senior naval officer as well, and understood fully the limits and capabilities of the naval arm.

In preparing this article, first as a study for himself, the writer has not sought great detailed accuracy and he may also be mistaken in political references, but he trusts that in divesting the account of much detail he has presented a fairly accurate picture of the war in its broad outlines, an *ébauche*, and the obstacles to great accuracy will be apparent to any one who attempts to unravel the thread of a South American revolution.

THE TRANSPORT OF TROOPS AND SUPPLIES.*

BY GEN. S. B. HOLABIRD, U. S. ARMY (RETIRED).

THE strategic value of railways for the rapid concentration of troops has been fully demonstrated, notably during the Franco-Prussian War. A nation whose *cadres* are well organized and whose young men are carefully trained as soldiers can dismiss to their homes half or two-thirds of its army personnel where well-devised and well-adapted railway systems exist, so organized as to assure the mobilization and assembling of the men with their corps without confusion and with quickness and certainty. The German empire to-day appears to be thus situated; her railway system is an important part of the defense of the empire. The lines converge and radiate upon some well-devised plan, having due reference to the operations of war.

As railway lines of this kind approach the frontiers, their important features and weak points must be securely protected by works adapted to this purpose. In some instances an entire valley should be closed in order that a short line may not be temporarily devised to turn the obstruction. The armed and guarded stations, as a matter of course, will be generally at strategic points, such as important intersections or the junctions of secondary valleys, and with the tunnels, bridges, and defiles strongly protected.

It is evident that the main lines from the capital, arsenals, and rendezvous to the frontiers should be studied and laid down with the greatest care and consideration for eventualities; they should debouch at strong points and, as far as possible, at the enemy's weak points. It is probable that commercial lines will pay slight regard to such considerations, but additional short lines, state roads, etc., may be arranged and annexed to supplement great commercial lines in many and various ways.

The modern power of concentration and mobilization has in itself a tendency to change the political geography of nations.

*Read before the International Congress of Engineers at Chicago, and published in the JOURNAL by permission of Major Clifton Comly, Chairman of the Division of Military Engineering.

It tends to bring together and to attach small states to greater ones, and to encourage larger aggregates; for with the modern development of railways small states would be quickly crushed in case of sudden hostilities, and it behooves their people, for their self-preservation, to cast in their lot beforetime with the stronger, and in this way this power of rapid concentration leads to the consolidation of states; it indicates also the importance of strong natural boundaries.

Peripheral railways, or those conterminous and those parallel to the boundaries of a country, must naturally be difficult to operate in case of war, since they are easily reached and easily struck at many points. Short portions of such lines between cities or strong places, duly guarded, may prove of peculiar importance to a defensive attitude.

The details of practice in the use of railway transport by troops can be most successfully arranged by railway experts in the large majority of cases. In those countries, however, where military duty is general among the people, the railway employés will naturally be assigned to their suitable duties, and military discipline and control will be superadded simply to their customary current management. Under more popular governments the higher railway officials should be commissioned and thus made to form a part of the general army staff for all purposes of railway transport. This was the method pursued in this country during the great civil war. Unless the railway officials are thus commissioned, the entire railway management is exposed to the obstruction of every ignorant or hot-headed officer, clothed with a little brief authority, who is thus carried to his destination; for human nature is such that in case of contact with civilians there are many very good, soldierly men who cannot let an opportunity pass of exhibiting their authority and importance on many unnecessary occasions.

In a country with numerous lines of railway and vast quantities of rolling stock ready to hand, there are immense possibilities of attack or defense, provided it possesses a competent military force. Great bodies of men and material can be moved over extreme distances at a very brief notice, by a vigorous government, directed by the necessary skill and ability. To make the results of full value, however, both men and material must be on hand in entire readiness and fitted for instant use in advance of the movement. A mob of ordinary untrained men and a mass

of incongruous, ill-assorted material are not of any special assistance in case of sudden hostilities.

Generally nations have found it advisable to organize trains and prepare their armed forces near the sources of supply, although it is soon discovered that it is actual experience alone in war that makes successful soldiers.

It is somewhat different with an unprepared people, where both parties stand upon the same footing; for the feeble may be overcome by sheer sudden press of numbers thrown against them at many points; provided always that a strong patriotic feeling inspires the movement. In such cases, even amidst ordinary confusions and uprisings, an enterprising and audacious leader may seize important points and so give an estimable advantage to one side at the very outset, presuming that the men whom he leads possess the proper animating spirit. So that from any and every point of view railways are important parts and adjuncts of the means of offense and defense of a nation. They add immeasurably to the power of a people for good or evil, weal or woe.

The application of steam changes greatly the difficult problem of moving supplies, for it at once disposes of thousands of animals used formerly for transport service and disposes of all questions of their replacement, handling, protection, and feeding. The problem is thus greatly simplified and reduced more nearly to a question of immediate national resources and of wise preparations. A government having determined in advance the object it has in view, the point of its attack, the character and extent of the force to be used, there presents itself immediately the question, by what means and methods shall the armed force, its material and supplies be moved to the scene of operations or the points of attack or defense; and also, by what additional means there shall be organized and maintained a steady flow of the necessary reinforcements and supplies, to maintain successfully the operations or the attack or defense.

It may be a problem of sea transport, and then comes in that other one of naval supremacy; or of a river line and a naval command of the river. But putting these aside let us consider at first the more usual instance of adjoining territories and simple land carriage. It may be laid down as a first condition that railways (one or more) leading to the zone of operations are necessary, in order to carry out successfully an extended and strong movement which shall involve the supplies of a large army. The railway

transport itself will have to be supplemented by a considerable body of vehicles attached to each corps, division, brigade, and even lesser parts of the three arms of service, for daily use in provisioning the troops by short trips to and from the nearest railway stations or temporary places of deposit for stores and supplies. These latter means of transport may be, and perhaps ought to be, a part of the equipment of the troops; or in case of necessity they may be a collection of the common vehicles of the country. The difficulty arising from a dependence upon country transport or the vehicles of the country will be constantly increasing, owing to the steady advance in railways and the dependence of all countries more and more upon railway carriage and a consequent steady diminution of animals and suitable vehicles for hauling throughout most modern nations.

In view of this disappearance of carriage resources in most countries, preparation must be made in advance to have each army division given sufficient equipment of wagons and animals to enable it to draw from near points of supply provisions for at least five days and sufficient ammunition for one serious engagement.

The problem then is reduced to what shall determine the extent of the land transport to be supplied with this object in view. The soldier will need for a daily full allowance of provisions about 4 pounds gross, and for five days, 20 pounds. One hundred men will require thus 2000 pounds for that time, and a division (from 10,000 to 12,000 men) will require 200,000 or 240,000 pounds. For this carriage there may be required from 100 to 140 wagons of a capacity of 2000 pounds each, or from two-thirds to one-half that number of very heavy wagons, although the safer allowance is that first given.

To these vehicles must be added those for ammunition for field artillery and small arms, and for forage for artillery and troop horses. One thousand rounds of small-arm ammunition for five men will give 20 boxes for each 100 men, or about 2000 pounds for each company; and 40 pieces of field artillery at 200 rounds per piece, at 20 pounds per round, gives as a total for the allowance of artillery corresponding to a division of infantry 200,000 pounds, or something like 100 wagons total. This allowance possibly may be considered excessive, but a liberal ammunition train would easily reach 200 wagons of a light weight, or two-thirds, or one-half that number, of a heavier character. So that

operating from a railway, for greater security, a division of infantry ought to be supplied with from 400 to 500 suitable vehicles and teams. If the corps to which such division belongs operates in the immediate vicinity of the railway, by compelling the men to carry a part of the ration and driving a part on the hoof as beef cattle, a portion of the train can be dispensed with, especially at times of great emergency and in order to secure speedy and great results; but to carry on war methodically, the full allowance should be provided if for no other purpose than to withdraw from hesitating generals that constant pretext of want of transport or want of supplies. A want of ammunition is a sufficient excuse for all sorts of delay at the present time; for with magazine or repeating arms fighting will be more and more reduced to a question of the supply of ammunition.

That force will probably best preserve its *morale* and manifest the greatest efficiency that has the most liberal supply of ammunition and uses it in the best manner. In the nature of things, cavalry, like artillery, needs large supply trains to be permanently efficient, for the moving or muscular power of the horse must be maintained at all hazards, or the cavalryman is left afoot and the guns and ammunition of artillery are abandoned. A horse requires 10 pounds of forage per day at the least, and the man 4 pounds of food and other things, thus bringing the daily requirements of a cavalry soldier up to 15 pounds per day, or about 1 wagon per day to a squadron of 150 mounted men. Three days' allowance would, perhaps, be sufficient for cavalry, as it moves more rapidly than infantry, so that about 65 or 70 wagons are required for 3000 cavalry for three days' forage and rations, or two-thirds more for five days.

An infantry soldier requires to have transported for him about 5 pounds per day; a field artillery soldier for himself and horse about twice that, and a cavalry soldier about three times that weight. In round numbers an army corps of two divisions of infantry, 24,000 men, a division of cavalry, 3000 men and 50 guns, will require, aside from artillery ammunition, to have moved, in order to keep up a five days' supply of what is consumed, 800,000 to 900,000 pounds, and so will need from 400 to 500 duly equipped wagons and a moderate artillery ammunition train of from 60 to 75 wagons, according to circumstances.

Should a corps let go its touch with the railway some new or independent method of supply will be immediately necessary, or

its wagon trains will be rapidly and enormously increased as its line lengthens out from its source of supply, unless it can in great part be fed and foraged by the country in which it finds itself, a method which usually causes great suffering to the inhabitants and a certain demoralization of the troops. This system has been put in practice at times by great conquerors and is advocated by some writers; but it adds new causes of uncertainty to the result of the operations and leads to untold horrors, so that, as a last resort, or in a case of absolute necessity alone, should this practice be adopted, of making war support war, as it is called, for the chief reason that the victims are almost invariably innocent of the policy that has involved them with misfortune, and the final result is likely to be disastrous even to the conqueror.

A government having duly fitted out its armies with proper equipment and provided the railway means to bring them into the zone of operations under the best generals it can provide, must then leave much to them and their genius. But can it hand over to them its railways and its depots of supplies? Not safely under ordinary circumstances, for there will be a competing struggle among different commands and corps, and the railways being civil rather than military in character, they should be presided over and controlled by those representing the very highest government authority and the deliberate wisdom of the State. The operations of the line of supply must be watched at the seat of government with care and energy, difficulties smoothed out, and a corps of experts in excess of current needs kept at all points, in order to repair and supplement every failure in this most responsible mechanism. All the bridges and assailable points of the line must be protected from a sudden attack or raid by a system of secure defenses of such a nature as to defy any ordinary surprise. The means of repairing breaches and damages in the line must be conveniently at hand in well-secured stations, and generally such a railway should be in constant telegraphic connection with the central government. All this precaution is not only to avoid the possibility of disaster, but to remove from an embarrassed commander a new and ready means to excuse his delay and shortcomings. The railway officials should be commissioned by the central authority and held responsible there; but they, too, should be watched with sleepless vigilance by those having power to correct and amend their neglect and failures. In other words

a single or double railway line of supply becomes, so to speak, vital to the existence of an army depending upon it. It is as a main artery to the human body and must be shielded and watched accordingly. An enterprising enemy will aim his blows at this artery and continue by every means in his power to weaken, cut, or destroy it. He will organize raids of picked troops, bands of desperate men, individual and collective, devise concealed marches, sudden enterprises, and great risks will be taken if there is a possibility of success. Therefore, corresponding care must be used to protect, at all hazards, such a line, so vastly different from the old-time lines of common roads and causeways, permanent or indestructible in character.

While railways are capable of playing such important parts in the operations of an army, it becomes necessary in time of peace to turn attention to giving to them a strategic character; that is, a character such as to make them readily available in carrying on military operations. As already indicated, they are very important in the invasion of a country, but as they may be turned about by a powerful enemy they need very solid protection on our own soil against such possible use; but like all instruments of war they are of infinitely greater value to the stronger in wealth and resources, men and materials.

All the ordinary railway vehicles are easily available in war for transport of men, horses, and supplies, and that nation having the greatest excess of such rolling stock can concentrate her troops the most promptly, and so produce the greatest immediate effect.

For this reason it seems most advantageous to employ as far as possible in all military operations the rolling stock in daily civil use, for thus there is that much prepared material gained or saved, and for another reason, that the trained employes are accustomed to these vehicles and can use them to the best advantage.

In fact so great are the seeming advantages given to a strong nation by a great development of its railways that smaller peoples cannot exist independently except on sufferance; and such a state of things will inevitably, as already suggested, tend to consolidate smaller with greater states for protection and self-preservation.

Again, to repeat, railways in themselves are a means of defense as well as offense; they enable a nation to throw from

point to point its several bodies of troops, as occasion calls, with extreme rapidity, and thus a smaller force can partially fill the place of a larger one, that would have to be divided and distributed to many separate points.

Railways point to or indicate the attackable places and so are indicative of defensive measures.

It appears, however, still that a force, taking the initiative vigorously, with suitable means, can more certainly profit by such action than can a defensive, hesitating, or retiring force, for the plain reason that a railway leading up to an objective or used by an advancing army is more easily handled than one leading from or employed by a retreating one; for in retreating by rail an accumulation of trains or vehicles easily blocks the action of the line, and the least break or obstruction may cause great loss. So it appears in modern operations as well as in ancient that the material as well as the moral advantage ought to be with the initiative.

Thus far railways have been assumed as the chief means of transportation, and we have only to consider with them wagon transport in its secondary or distributive form for short and varied hauls, making use in most cases of the equipment of the troops.

All nations prepared for war furnish their troops with field transport, to a more or less limited extent, to enable them to operate at times and on occasions at a considerable distance from the intermediate sources of supply. Especially is this true in regard to the necessary ammunition, bread rations, medicine, and hospital stores. Forage of grain and hay may most generally in part be found in the country, and where it is not so found the teams and conveyances of the country may, in many cases, be made available for temporary and local use.

In a country like North America or South America large supply trains are necessary, even with the assistance of such railways as are found to exist. The trains must be improvised at the breaking out of hostilities, but in both countries abundant means are at hand, and suitable drivers, ready trained in similar service, to be had at will.

It would be inexpedient to expend money in time of peace in preparation where none is needed. It should seem wiser to expend what money can be secured to arm and train men for the combatant features of war, such as keeping alive the traditions of the past and preserving the military spirit always tending to be-

come extinct in the midst of industrialism. It is true, of course, in general terms, that that country will have reason to hope for more years of peace that is best prepared for war or to defend itself from attack.

Land transport, however, is everywhere a local problem. It is not practicable to bring it to any considerable uniformity throughout the world. In Asiatic countries the means and methods must greatly differ from those available in Europe or America. In the past vast expeditions have been made in Asia, where pack animals and very rude vehicles sufficed, but an army of servants and employes were easily available to vitalize, as it were, the service.

With the introduction of railways even these great efforts become simplified and stripped of many disadvantages and difficulties, saving both the animals and resources of the countries affected.

In our country the special draft animal is the mule, a patient, much enduring beast of burden, capable of surviving strange vicissitudes, and much neglect and bad treatment. The vehicles of the country answer a very good purpose, supplemented in part by such as are required for artillery, material, ammunition, and the most valuable supplies, such as must be conveniently at hand and such as are difficult to replace.

In the management of railways each nation will have its own policy. Where these roads belong to the State public measures for their management in time of war are needful. In a country like ours such steps are unnecessary, for abundant means can be readily furnished by the great companies for any movements whatsoever. It is only necessary to commission with the highest authority the leading railway officials that enter into public employ, as already stated, to fit them to take charge of troops and stores that are to be handled and moved. The high commissions are required to prevent meddling and interference.

But with a country situated like ours let us hope that the best preparation for war is to be found in an industrious, enterprising, inventive, free people, and the best guarantee of peace the just, fair, and honorable dealing of its government with all its neighbors.

INFANTRY FOOTWEAR.*

BY LIEUT. NAT P. PHISTER, 1ST U. S. INFANTRY.

IN considering the great number of things which contribute in a greater or less degree to the success of an army in any series of operations which may be undertaken by it, we find at every turn, that we are confronted by some problem involving transportation. Assuming that all soldiers will fight equally well when actually confronting the enemy, there still remains the question as to how an advantage is to be obtained by placing in opposition to that enemy, at the most effective place and time, a force sufficient to oppose him successfully.

Whatever we may have done, or may in future succeed in doing, to increase the facilities for the rapid movement of large bodies of troops by rail or otherwise, the whole history of the art of war shows us in unmistakable terms that we can never afford to ignore the immense advantages which an army may derive from a superiority in the marching power of its infantry; and this applies with equal force to the speed in tactical manoeuvres which rapidly shifts the weight to suit the event, in the hurry and turmoil of the battle-field, and to the power of sustained endurance which will, in the strategical operations of a long campaign, inevitably give a superiority to the best marchers, if other conditions are approximately equal.

Reason and precedent justify us in assuming that marching power, including in the term both speed and endurance, must always remain a prime factor in the determination of success.

The veteran of the Imperial Guard who, while on the march in one of Napoleon's rapid strategical combinations, remarked to a comrade "The 'Little Corporal' fights with our legs in this campaign," stated a truth which, generalized, would have a wide application in the history of war.

Preparation for war must always consist in the painstaking elaboration of innumerable details, and in the proving and improving, in peace, of the many small means contributing to the great end in view. It is my purpose herein to call attention to

* Graduating essay at the U. S. Infantry and Cavalry School.

one of these contributory means, and to attempt to show the proper direction to be taken in the steps necessary for its improvement.

Every man who has marched at all, knows that footwear is, even for the unladen marcher, of the utmost importance; and this is more apparent in the case of the soldier in campaign, who marches in all kinds of weather, burdened with his wardrobe, means of shelter, ammunition and weapons. Leg-weariness wears off in a few days tramping; the pack, so heavy at first, becomes lighter by the adaptation of the muscles to its presence, as well as by the abandonments which will surely result from the bearer's simple balancing of values between carriage, and possession when at rest; but a cramped or chafed foot, in the bad shoe or stocking which caused the injury, does *not* get better with increased misuse.

If we wish to march men well, far and rapidly, or to keep them steadily going, day after day for a long time and at a telling gait, we must look to the welfare of their feet.

They should be carefully instructed how to take care of their feet to keep them sound, of course. A hygienic discussion offers a tempting field here but it is not necessary to the purpose of this essay. Considering soldiers simply as machines, and assuming the fuel and water supply to be properly cared for, their legs will hold out if their feet will. It should never be forgotten that the mere presence of troops at a given point at a given time, however opportune, may have no value unless they are in a fit condition for the rapid marching which is nearly always necessary in making tactical dispositions for battle, and that the demands upon their speed and endurance do not cease even when a battle is won, for pursuit should confirm success.

In considering nature's means of transportation for the individual man, we find that the feet are the portions of the machine subjected to the most constant strain and to operation of external wear, and that whatever strengthens the machine or protects it from wear at this point, contributes directly to both speed and endurance.

Let us then consider what are the requirements which, if complied with, will give us the desired increase in ease and power, so far as that increase may be derived from improvement in footwear.

1st. Protection from wear. 2d. Freedom of action for the foot. 3d. Lightness. 4th. Flexibility of the shoe. 5th. Fit.

The above numbers have no reference to the relative importance of the several requirements named, which are so coördinated that such a classification is practically impossible. The separation is only made for convenience of discussion and the requirements are for stockings as well as for shoes.

1st. Protection from wear.—The first protective article of footwear devised by man was probably the sandal. It really protected from undue wear, and from injury by the roughness of the ground, only the sole and the lower parts of the sides of the foot.

It was then an insufficient protection, but as far as the other requirements are concerned, its excellence cannot be questioned; and if we compare it with the sole of the modern shoe of which it is the prototype, we will find that however much we may have improved as to material we have certainly retrograded as to shape. The upper has simply been added to the original sole to give protection to the upper portion of the foot. The sole must be heavy and compact to stand the wear from the ground, while the upper, having no great wear except by its own bending, may be quite light.

2d. Free action from the foot.—It is not necessary to go into the anatomical structure of the foot: Any reader may look at his own feet and consider them illustrative examples of the remarks herein made.

The structure and action of the arch and forward portion of the foot show plainly that it is intended to be used as a flexible, elastic, weight-bearing structure, and that anything which impairs its elasticity and flexibility must interfere to that extent with the proper performance of its natural functions.

Any one must admit that it is a plain violation of nature's laws habitually to cramp, imprison and distort any portion of the human frame, and yet, as to the foot, we differ from the Chinese women only in degree. Not one adult in a hundred has any power to separate his toes when barefooted—but all babies have it.

A fair average width for the weighted foot of a medium sized man, measured across the ball, is about four inches. Measure a number of the soles at this point and you will find the average much less. In other words, the shoemaker expects either to cramp the wearer's foot down to the size of the last, or to have his foot project over the edge of the sole from one-half to three-fourths of an inch. The spring of the weighted arch lengthens

the foot and the forward part of the foot spreads laterally; hence, to fulfill this requisite we must make the sole as long and as wide as the weighted foot and we must have no undue constriction by the upper. Can you imagine a Roman soldier or an Indian cutting his sandals narrower or shorter than the extreme measures of his weighted foot? I think not.

3d. Lightness.—It is, or should be, plain that the shoe should be as light as is compatible with the fulfillment of the first two requirements.

Most shoes intended for standing much continuous wear are made far too heavy, particularly so as to the uppers. Uppers cut from good heavy calf-skin (say 5 or 6 pounds to the skin, depending on size) are heavy enough for any wear, and, for that part of the shoe about the ankle there can be no objection to the use of much lighter material, such as canvas lined sheepskin (the so-called "kid" of the trade).

Our cavalry give careful consideration to the weight of their *horse-shoes* (weight of troopers' boots is four pounds) and comparing the weight of the foot soldiers' shoes (issued by the Q. M. Dep't.) with these horse-shoes it is found that the soldier, whose power is rated at about $\frac{1}{4}$ that of the horse, is expected to carry upon his feet a weight considerably at variance with the proportion of power which he develops. A recent comparison of weights resulted as below. So many different weights were given for horse-shoes that the weight taken is stated upon the authority of several cavalry experts, who gave it as the proper weight for a full set of shoes for a horse of medium size.

Weight of full set of horse-shoes, 48 oz.

Weight of pair of soldiers No. 8 shoes (latest pattern), 40 oz.

Weight of pair of soldiers' cavalry boots (latest pattern), 64 oz.

It is as desirable now as in the days of pilum and shield, that a soldier should be a trained athlete. The soldier should be a racer. We do not shoe a race-horse like a beast of burden, and for the purpose of his business a soldier needs, and should have, the lightest, strongest and best of shoes. If the present shoes are intended to serve the purpose of the double weighted arms of exercise which were used by the old Romans, they are not too heavy; but if they are intended for daily use in actual business by a man from whom speed is to be required, they are far too heavy.

4th. Flexibility of the Shoe.—This is only another feature of

the consideration concerning freedom of motion, but as it involves more particularly the material and make up of the shoe, while the former consideration has more to do with its fit, flexibility is considered separately. Assuming from the start that leather is the material to be used, it may be confidently asserted that, weight for weight, there are great differences to be found between the various kinds of leather. Some leathers, notably hemlock sole leather of the usual market grades, are hot tanned, and this makes them stiff, hard and less tough. Cold tanned oak sole leather of proper thickness, and well rolled to make it compact, is eminently desirable in every respect, and, while it costs about one-third more than the hot tanned hemlock sole, it is fully worth the difference.

As to upper leather, it will be found that the tanning has a great deal to do with its quality. It will be found also, that no such leather is good which does not include the whole thickness of the hide. The middle layer of the tanned bovine hide is fibrous, absorbent and tough, but it cannot be dressed, shaved, rolled or pressed to a permanently smooth surface, or to any surface which will wear well; and therefore a piece of leather, originally too thick, which has simply been split or skived down to the required thickness, has been so treated at the expense of one of its wearing surfaces, and the surface so exposed is so loose and fibrous in texture that it will not properly retain dressing, rapidly absorbs moisture and soon hardens and stiffens until it will break.

Much of the "upper leather," so-called by the trade, is of this character and it is not, in my opinion, fit to make any part of a shoe to be worn on a human foot. It is obvious that the extra thickness which necessitates splitting, accompanies greater age and size in the animal from which the hide was taken, and, therefore, a coarser texture of the hide, which tends to increase the defects spoken of. Our soldiers wear, or have for years worn, shoes made from leather of this kind, and the fuzzy, cloth-like appearance of the leather is familiar to every observant officer. Soldiers call them boiler-iron shoes, and they deserve the name.

Lately a move has been made in the right direction by having the shoes cut from "kip" (only a trade name for hides lighter by a trifle than "upper" and sold in the whole hide by the pound; while "upper" is sold in "sides," the hide being cut in half down the back and sold by the square foot), but the reform does not go far enough, as will be seen from the weight of a pair of these "kip" shoes (40 ounces).

To get proper leather then, we must obtain it by careful selection from such hides as by natural size and thickness (resulting from age and size of the animal) are best suited to our requirements. Well tanned calf-skin is the best material to be had, and, though perhaps not so attractive to the eye, grain dressed calf-skin is better for soldiers' shoes than that dressed on the flesh side. A moment's consideration will show why grain dressed leather is better. The skin of the animal performs excretory functions, and it seems plain that to reverse its position when putting it in the shoe is to invite the entrance of moisture; in addition to this, if the grain is out the wear is in nature's own direction. Practice has proven the truth of the above, for sportsmen have for years used grain dressed shoes, and they find them better. The materials mentioned above will give the required flexibility and lightness—they are easily obtainable and should be used.

5th. Fit.—From the heel to the forward portion of the arch of the foot the shoe should fit snugly to avoid slipping and chafing, and it may so fit without interfering with freedom of action because this portion of the foot does not spread, laterally, under weight, though the length of the whole foot on the ground is increased by the flattening of the arch. The shank of the sole may therefore be narrow.

Forward of the shank, the sole should be broad, as already mentioned, and there should be no surplus leather in the upper. I refer here to a very common error made by shoemakers, some of whom seem to think that breadth of foot across the ball must always be accompanied by a corresponding increase in thickness, whereas, with feet of the same length the converse is nearer true. The whole matter is right here—*Fit the weighted foot*. If it were possible to do so, every shoe should be made to individual measure. As this is practically impossible for soldiers, what is the next best way to give them what they need? Evidently such an assortment of sizes as to length, width, etc., as will enable us to go into a quartermaster's store room and fit, with a comfortable shoe, any man whose feet are not abnormal in shape or size.

Can this be accomplished? Unquestionably it can.

A good shoe dealer can, from his stock, fit almost any foot (*military fit not here understood*) and there is no reason why the Quartermaster's Department should not be able to fit any soldier's foot. The fact that soldiers' feet are all examined and passed

upon by competent surgeons, narrows the limits of variation so much that no very great diversity of shapes and sizes would be necessary to meet every demand. It cannot be urged that much stock would be left on hand, for, with dimensions fixed between reasonable limits, the law of chances would take care of the rest. Keeping such an assortment pays the dealer, who calculates upon probable diversity and demand with far less certainty than would be possible for a supply department of an army. Go into any large shoe store and they will present, for your selection, from six to a dozen different widths and shapes of the same style of shoe at the same price.

A few years ago the Government spent \$10,000 to have an alleged expert go about through the army teaching a system of horse-shoeing (he and his system are anathema maranatha among our cavalry officers to this day and the crippled horses have died or been sold—but the money *was* expended). A much less amount, judiciously expended upon and by one of the few really scientific shoemakers in the country (for there are a few who are pretty well known as specialists in their line), would probably result in a vast improvement in military shoes. Such a man, by comparison of data which could easily be furnished him, or which he could easily obtain, would be able to determine what variations in size and shape would be necessary, and to fix the shapes of a full set of military lasts, which would insure the success of a system by which each individual soldier could be fitted as a shoe dealer fits a customer. The soldier's shoe would be improved in fit, comfort, and utility, provided the system was adopted and that proper materials were used—but we would probably have to abandon some wrongly preconceived ideas as to style.

We may reasonably suppose that the improved shoe would be of grain dressed calf-skin—medium weight—hand-sewed—with a heavy oak-tanned sole projecting slightly beyond the upper—with a flat shank and a low broad heel—with a smooth insole slightly dished at heel and ball—with a width of sole at the ball slightly greater than that of the weighted foot, and with the upper across the ball so cut that there would be no slack leather. The shoe would probably be a half-boot shape, lacing with a few holes over the arch and having soft loose tops about the ankle, which would leave the ankle free to develop, as it would, a strength and elasticity proportioned to its work. I do not consider it necessary or advisable to support the ankle by tightly

laced leather. The sinew and muscle developed by exercise are the best supports for any part of the framework of a soldier. The sole of this improved shoe would be as nearly as possible the shape of the bottom of the weighted foot, and slightly rounded off at the toe for increased protection to the ends of the smaller toes. A light metal plate at toe and heel would increase the life of the shoe.

Such a shoe would not be pretty or stylish, but it would not hurt the soldier's foot and in it he could march far and fast and come in still fit to move rapidly, provided that his other needs were cared for.

Right here it is proper to speak of a recent article by a French officer upon the subject of the peculiar fatigue resulting from marching. In saying that this fatigue and nervous strain results from the continued rhythmical repetition of a jar, transmitted at each recurrence in the same direction through the same bones, muscles and nerves, this writer has only formulated a principle well known to every man who has marched much: but I do not think much of his remedy, which consists in the use of an elastic cushion under the heel. An American invention, on precisely the same principle, is advertised for the use of nervous invalids, but soldiers are not usually of that class. If we have to deal with a recruit who jabs his heels into the ground we can correct it. Elasticity of tread comes with practice in marching, and with the strength and proper development of muscles which are its legitimate result.

As to the durability of such a shoe as has been mentioned, it may safely be asserted that with some slight attention from the cobbler, who, with some of the simplest tools of his craft and a supply of leather, should accompany each infantry company, two pairs of such shoes will, over ordinary roads, wear for 1700 miles, which is a greater distance than any soldier would probably have to march without an opportunity to renew his shoes. The net cost would be about one half a cent per man per mile. Each soldier should have furnished him to be cut by the cobbler, after his shoes are well broken to the foot, sufficient sole leather for a pair of slip soles which should be cut accurately to fit the inside of the shoe. The advantage of these slip soles when on the march is very great; they can be taken from the shoes, beaten together to remove the dust, after being dried in the sun, and then replaced for the next march; thus keeping the inside of the shoe

fresh and clean. It is an open question whether one pair of such shoes and a pair of light camp slippers would not be a sufficient supply for the soldier to carry on his person in campaign. Casualties would furnish many opportunities to renew shoes.

It is a little curious, to one who has never thought of it, how the cost of shoe leather foots up, and how easy it is to reach an approximation to the cost by a simple calculation, provided one has, to start with, a few data as to the distance one pair of shoes, of known cost, is good for.

I have made some experiments in my own case as to this, and have above given the result of them and of a careful observation of these matters for about ten years.

As to the issue of a better shoe, of the kind described, to our army, the question of price need not enter the discussion at all so long as the increase is not too great. Such shoes can be made at a cost of \$4.00 per pair, which, considering quality, is no great increase on the present list price (\$1.89) of the sewed campaign shoe. For a soldier, a good shoe, like a good rifle, is beyond any paltry consideration as to price.

Another thing should be spoken of here. If a shoe is good enough for a soldier to march in, it is good enough for him to wear at any time when on duty, and nothing but the high class (unstylish) marching shoe should be issued at all, unless the light camp slippers spoken of should be adopted.

Having determined to issue the shoe and having employed our specialist to determine sizes, etc., we would probably have for issue of each size of shoe by length, say nine sizes. For example:

SHOES NO. 6.

	High Instep.	Medium Instep.	Low Instep.
Width	A	A	A
	B	B	B
	C	C	C

The number of widths need not exceed three, since the variations in the weighted foot are much less than in the unweighted foot, and besides, we do not consider style as an element of selection.

Taking Recruit Ferguson into a quartermaster's store-room where all the authorized sizes of shoes are kept, we would have no difficulty in fitting him with a proper shoe; an officer should be present and see to the proper fit of this first pair of military

shoes and there would be no trouble afterward. It would appear on Ferguson's descriptive list that his size was, say, No. 6 Medium B, and requisition could be made accordingly; but Ferguson should not be allowed to draw a shoe of different size without first exhibiting to an officer the fault of his last shoes, nor without an officer to supervise the fitting of the new ones.

I have indicated three divisions by height of instep. It is possible that a tabulation of many measurements would show that some other dimension should be made the basis of division, but the principle would be the same. I have only intended to indicate the main features of a system, not to elaborate finer details; for that, the services of a scientific shoemaker should be obtained.

I have spoken of a cobbler's wagon. It is a necessity; no forge, forge wagon or battery wagon is so much so. Some arrangement for mending the shoes of the soldiers during campaign should always be made.

So much for the shoe.

A much more neglected article is the stocking. More blistered feet, corns, ingrowing nails and overlapping toes result from ill-fitting stockings than from bad shoes. With the stocking the fault is nearly always the same—narrowness at the toe, and the present issue stockings have it.

The stocking should be of cotton, soft woven, seamless and shaped like the foot.

A recent writer says "So unheard of is hosiery of the exact shape of the foot, that some one has recently acquired a patent on it in this country." Comment is unnecessary.

The stocking should be held up so that it will not wrinkle at the heel and produce blisters. A soldier with calves on his legs cannot keep his stockings up properly without garters. Garters are not objectionable if they do not tightly bind the leg, and modern ingenuity has overcome that objection. To complete the comfort and security of the soldier's nether extremities we have the present canvas legging. It is excellent, and would go well with the proposed shoe, but the pattern might be improved by narrowing the ankle slightly.

It was not intended in this brief essay to write a history of shoes, to compile data as to their use and abuse, or to give a perfect system by which perfect shoes could be procured and issued, but only to point out a few of the essential particulars in

which the footwear of our infantry could be improved, and to call attention to the importance of improving it. No part of the soldier's clothing or equipment is more important. A soldier can and frequently does fight in his shirt sleeves and bareheaded, nor is his military efficiency impaired by a canvas patch on his trousers, but if his shoes give out or his feet get sore he will not be on hand to fight at all. By the failure of the shoes, the man, his arms, and his ammunition are lost for the fight.

During the time I have taken in observing this matter, I have marched about two thousand miles, all told, and have closely observed and questioned the men of my company about their shoes. I have seen about five per cent. of a regiment of three hundred men disabled for hard marching by sore feet, in a march of ninety miles over good roads, going at the rate of about twelve miles per day; and, as a contrast, one company of the eight present in that regiment went through without a sore foot in the entire company, simply because its captain had looked carefully to his men's shoes and had each man prepared with well broken, well greased shoes of proper size (it was not required that the men of this company should wear the issued shoes, but no shoe might be worn unless the captain approved it).

In war five per cent. would be a heavy interest to pay for poor economy.

This whole matter, while worthy of the close attention of all military men is, comparatively, a neglected field. The subject is a homely one and has none of the attractive glitter of more pretentious themes, but it is worthy of much thought and deserves a better presentation from some more skilled and facile pen than mine. The Great Napoleon hanged a contractor for stuffing soles, and he discovered the fraud by cutting up a shoe with his own imperial hands. Wellington is said to have enumerated the three most essential articles of a soldier's equipment as—1st. A pair of good shoes—2d. Another pair of good shoes—3d. A pair of half soles.

The feet of the soldiers of our army are among its most effective weapons and they deserve and should receive all due care, and the army in which this care is neglected will bitterly regret the omission at a time when it has much more than vain regrets to occupy its attention.

THE MILITARY HAND-LITTER.

BY MAJOR JOHN VAN R. HOFF, SURGEON, U. S. ARMY.

A DISTINGUISHED writer on military sanitary subjects has said that among ambulance transport material the hand-litter is the most important element, and the essential features of its construction should be, 1st, strength; 2d, simplicity; and 3d, lightness.

The hand-litter of the U. S. Army, the *rahmen* of the Germans, the *brancard* of the French, the *camilla* of the Spanish, and the *barella* of the Italians, etc., are names given to different forms of an apparatus whose purpose it is to sustain a wounded man, and whose form, varied in its expression, consists essentially of a canvas bed in a rigid frame stretched by cross pieces fixed or otherwise.

A word to those who would venture into this field of invention may not prove amiss from one who has wandered in its mazes for several years. As stated in the opening sentence of this paper, strength, simplicity, and lightness, are the *sine qua non* in a military hand-litter. The writer has seen many litters theoretically evolved to meet practical active service conditions, wonderful in their ingenuity, but which are sure to be utterly useless when most needed. It is not alone the wear and tear entailed in actual use that must be considered, but the awful abuse that all military material is subjected to under the varied conditions of service transportation. I have seen a stack of litters knocked down and run over by an army wagon weighing tons, and escape without damage. I have seen them thrown into wagons and hundreds of pounds weight packed on top of them. I have seen them abused in all manner of ways, and yet retain their usefulness. Imagine the fate, under like conditions, of the ingeniously conceived and elegantly constructed apparatus that is so often presented for our approval: such might doubtless fulfill the requirements during the halcyon days of peace and parades, but in war it would be worse than useless. Hence, we must be content with a "less perfect contrivance if its continued serviceable condition can be relied upon with a fair amount of certainty," rather

than choose the most perfect machine which is liable to get out of order.

Says Longmore: "Practical acquaintance with the exigencies and actual circumstances of a state of warfare, joined with a proper understanding of the best method of achieving the particular object in view, can alone enable a right judgment to be formed respecting the fitness or otherwise of any special contrivances which are proposed for use in campaigning."

The parts of a hand-litter are:—Two side poles; two cross-braces; four legs; a piece of cotton or hemp duck; two slings. The side poles are made of wood long enough to furnish attachment for the duck and allow for handles by means of which the apparatus is carried. The poles must be sufficiently rigid to prevent springing and strong enough to withstand much abuse. With ash a square of $1\frac{3}{4}$ inches has been found adequate. The ideal pole is of some metal light and strong, possibly an alloy of aluminum, for in the poles lies the chief weight of the litter, and weight is a matter of the utmost importance.

I saw at the Columbian Exposition in the admirable military sanitary exhibit made by the Japanese government, a litter of most simple construction in which the side poles were of bamboo. In my mind's eye I pictured the stricken oriental carried from the field on this apparatus; as the wearying bearers progressed through their 1500 yards journey, more and more swing they imparted to the litter, and with more and more spring did the elastic reeds respond, until finally the state of the wounded victim was akin to that of the man tossed in a blanket, who feared the worst but hoped for the best.

The cross-braces hold the poles apart and stretch the canvas (hence the name "stretcher" so commonly used); they are usually made of iron either in a single piece, in which case they most frequently have a ring at each end to slip over the handles, or are jointed at the centre, which I believe is the latest development. It is the cross-brace which most frequently gets out of order.

The chief object of the legs, it is scarcely necessary to state, is to keep the litter off the ground; they need not be long, and should be fixed. I am indebted to a well recognized authority for the following upon this subject: "To obtain the greatest steadiness it is desirable that the feet form a part of the traverse (cross-brace) being derived from the traverse-plate on the under

surface of the pole. On no account should the feet be separated from the traverse, or a 'wobbling' motion will be conveyed to the stretcher with the least movement of the patient lying on it. The feet are liable to spread and the whole conveyance is unsteady. This is particularly the case with those stretchers whose inventors, with the least possible knowledge of the requirements of these field conveyances but who assume that they have conquered the many difficulties that still exist, throw on the market articles with collapsing sides, self-acting automatic feet, a canvas divided into two or more pieces, in short a stretcher containing all the faults that have been pointed out for years, and without a single feature of the requirements of stretchers at the present time." The same distinguished author continues, "the feet in most stretchers are between 5 and 6 inches long, made of iron, being flattened out into feet, and hold boxwood rollers. The addition of rollers was a great advance, reducing the risk of injury to the feet, increasing the comfort of the patient," etc., with which latter statement I do not agree. I subjected a litter of this character to careful trial for some time while on the frontier, and found that the wheels very readily clogged with mud, when of course they became no better than a wheelless leg. So I abandoned the wheel as a useless and expensive addition.

The duck which I have found most durable is of hemp [16 oz. to the yard] 6 ft. 2 in. long by 24 inches wide, of which an inch is turned over at either end and sewed down, and an inch is turned down on each side and tacked to the poles, thus making the bed 6 feet long and 22 inches wide in the clear. It should be of a dark brown color.

The pillow attached to many patterns of hand-litters seems to me an unnecessary complication. A blanket or knapsack is usually at hand and will serve a better purpose than pillows, which if detachable are easily lost or if permanently attached are never stuffed.

The slings, made of leather or webbing, are used to assist in supporting the litter and are in my opinion absolutely essential to good bearer work. To insure their presence with the litter they should be permanently attached to it. As this view does not coincide with that of some military sanitarians I will somewhat dogmatically state the following propositions.

- 1st. The sling is never used without the litter.
- 2d. The litter should never be used without the sling.

To the first proposition no one can take exception.

To those who would negative the second proposition I can only say *experientia docet*. Let them carry a loaded litter from firing point to target butt on the 1000 yard range with and without slings, and I am sure they will no longer be doubting Thomases. It was a common practice while I was in command of the Company of Instruction, Hospital Corps, at Fort Riley, Kansas, to march the men with loaded litters a half mile out and back. I have tried them repeatedly with and without slings and always with results incontestably in favor of slings. I have seen thoroughly instructed men who had been warned never to carry the litter upon the shoulders, start off in position "by four, carry, litter," and bring the litter to their shoulders before they had gone a hundred yards. If this be so with trained bearers, how much more so would it be with the comparatively untrained men whom we must make use of in active service?

Speaking of bearer work, Professor Billroth says, "Just try this carrying for 500 paces or even 700 or 800 paces, it's no joke, and for any great length of time impossible."

I recognize the fact that slings complicate the apparatus and the drill, but certainly not beyond their value; and this very complication will cause their removal and loss if they are not permanently fixed to the litter, moreover, we know that in the field the *meum et tuum* are not so clearly defined as under more civilized surroundings, and when a strap or buckle is wanted what more convenient than a stray litter sling?

I wish I might be able to impress the depth of my conviction of the correctness of this view upon my readers. It is not based upon theory but is the outcome of experience, limited indeed, gained under every condition of service that a medical officer is subjected to.

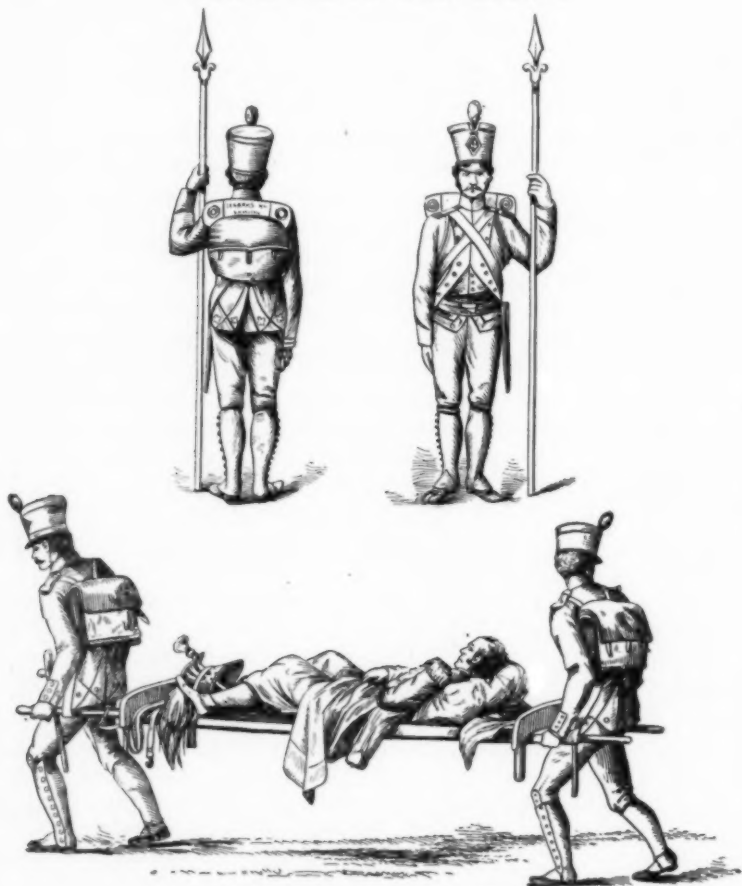
For the following description of the hand-litters in use in foreign armies I am largely indebted to that most valuable contribution to military sanitary knowledge entitled a "Manual of Ambulance Transport,"* by Surgeon-General Sir T. Longmore, C. B., etc.

Baron Percy of the French army to whom, with Baron Larrey (1746 to 1842), we are indebted for the first systematic sanitary organization in any army, says of hand-litters, "What is wanted

*2d Edition, edited by Surg.-Capt. William A. Morris, A. M. S.

are brancards which shall always be at hand and which the men can carry in equal divisions as easily as they can carry a fire-lock. These are the prime conditions to be sought for in this form of conveyance." In accordance with this view the various parts of

THE PERCY BRANCARD. PARTS DISTRIBUTED.



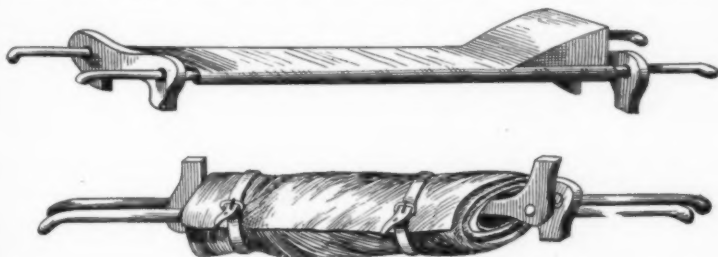
THE PERCY BRANCARD. PARTS ASSEMBLED.

the litter were made separable, and were carried by two bearers. Each carried a pole 8 feet long, one end of which received a lance-head and the other a ferrule; the former was removed when the pole became part of the litter, and was carried in a scabbard sus-

pendent from the bearer's belt. Each also carried a cross-piece fitted over his knapsack, and half of the canvas folded flat and worn about the body.

The disadvantages of such an arrangement far outweighed the advantages, and the principle is still maintained, for the most part, only in certain forms of litters used in civil life, which have no place among war sanitary material.

The Mundy Rahmen [Austrian Red Cross] is a reversion to the Percy type, and has all the defects inherent in that litter.



THE MUNDY RAHMEN.

Parts that are separable will certainly be separated, and as certainly lost. The prerequisite in a military litter is that no part of it should be removable without destruction.

THE PRUSSIAN RAHMEN.

The Prussian Rahmen consists of two wooden poles 8 feet long, separated at each end by two iron cross-pieces. A piece of flax ducking is stretched on the frame forming a bed 6 feet long and 22 inches wide. Two straps are attached to the poles which can be buckled over the patient to secure him to the litter. The head-rest, a separate frame covered with duck, works by rack and pinion. The litter has four fixed legs 12 inches long, and its weight is 30 pounds. This apparatus makes an admirable litter so far as the patient is concerned, but the space required by it in its own transportation, and its weight, condemn it. It has been modified by hinging the poles at the centre which makes it even less durable. No mention is made of slings in connection with it.

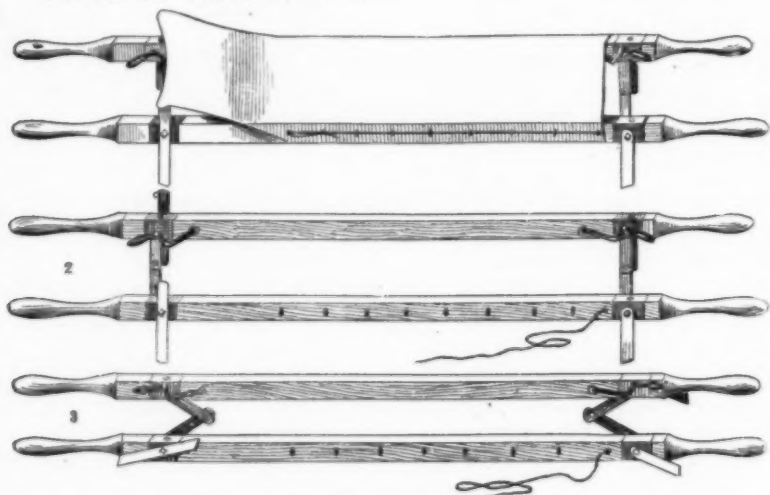
THE FRENCH BRANCARD.

Two forms of hand-litter are used in the French army, known as the Beaufort and the Frank brancards.

In the Beaufort brancard the poles of ash are 7 feet 6 inches long; the cross-braces of iron are fixed at one end by a

bolt; in the other (free) end, slightly enlarged, are two holes through which they are fastened to the opposite pole by a copper screw. The folding legs attached to the outside of the poles are of wood, their movement being limited by a spring; those at the head of the litter are 6 inches longer, the additional length when the litter is opened projecting above the sides. The end of the canvas being fastened to the tops of these projecting pieces forms a pillow.

In the Frank brancard the cross-braces hinge at the centre and are permanently attached to both poles. The canvas is doubled at the head to be stuffed with hay or other material for a pillow. The slings are made of webbing, which when the litter is closed are wound around it.



THE FRANK BRANCARD.

The criticism to be made upon this apparatus is that the folding legs will certainly get out of order, and that they will not permit it to be slid into an ambulance wagon, without their being closed, in which event the litter is liable to be collapsed by the cross braces striking against some projection.

THE AUSTRIAN RAHMEN.

Longmore says that the hand-litters of this army have nothing to recommend them except possibly cheapness. While this quality is a commendable one in an efficient apparatus, it certainly

should be the last consideration where efficiency is concerned. Some of these litters are constructed on the principle of the Percy litter; others, following the modern developments, have hinged cross-braces,—and still others are much like the Spanish camilla.

THE ITALIAN BARELLA.

The Italian army is unfortunate in the possession of four different patterns of hand-litters.

One form is divided at its mid-length like the Prussian litter; another is rigid, again like the Prussian; a third seems to be constructed on the Percy principle and is used in mountain work; the fourth is on the lines of the first, but strange to say, the canvas is raised at both ends. No slings are mentioned in connection with these litters.

THE SPANISH CAMILLA.

The camilla of the Spanish army, adopted in 1837, is practically identical with the Percy Brancard. This appliance, says the *Manual del Soldado*, was adopted by the Medical Corps for use by the military sanitary companies which were then for the first time organized in the Spanish army, and which took part in the siege of Bilbao. After passing through various modifications it, in 1859, was officially designated Camilla Española; but its final form, evolved through twenty years' experience, bore very little resemblance to the Camilla of 1837. As now recognized the regulation Camilla Española consists of two side-poles, a head-piece, the canvas, two cross-pieces, and four feet made of iron.

The poles are of beech, uniformly cylindrical, and are protected at each end by an iron (tinned) ring. The cross-pieces, at each end of which is a ring through which a pole passes, and to which a foot is joined (and extends above the pole), also serve as points of support for the head-piece or inclined plane. The head-piece frame consists of an iron rod running from a ring 12 inches in front of the ring to which a foot is attached, backward and upward to the extension of the foot, then across to the upward extension of the opposite foot, then downward and forward to a ring on the other pole opposite that from which it started.

The canvas is in two pieces; one has a wide hem at either side for the poles to slip into, and two strips of strong canvas, one sewed lengthwise and the other crosswise, to strengthen it; its free ends are bound with leather; the other forms the pillow,

being fastened underneath to its fellow by three straps and buckles.



THE SPANISH CAMILLA.

Its dimensions are:

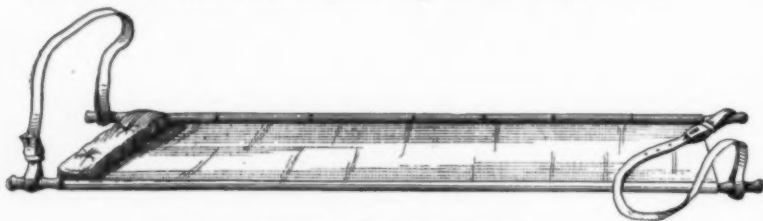
Length of canvas	-	-	65 in.
Width	-	-	24 in.
Height	-	-	9 in.
Weight	-	-	21 pounds (Spanish).

Leather litter slings are used.

THE BRITISH FIELD STRETCHER.

Our cousins of the "tight little island" whose admirable efforts in the direction of advanced military sanitation are a constant stimulus to us, also labor under an embarrassment of riches in their many patterned hand-litters, which, however, are slowly crystallizing into the single ideal apparatus. The following description of some of them is from a manual of the Medical Staff Corps.

The Mark I. or old pattern stretcher, consists of a stout piece of canvas stretched between two slight round poles of ash.



THE MARK I., BRITISH STRETCHER.

The poles are slipped into plaits made at each side of the canvas and are kept the requisite distance apart by two iron rods (traverses) each of which is fastened by a staple to one of the side-poles and being bent at right-angles at the other end fits into

a hole in the opposite pole at about seven inches from its extremity. This stretcher is provided with a small horse-hair pillow and a pair of slings, and its dimensions are :

Poles,	-	-	-	8 ft. 1½ in.
Canvas,	-	-	-	6 ft. 8 in.
Width,	-	-	-	2 ft. 2 in.
Weight,	-	-	-	16 pounds.

Longmore says that this appliance is not free from important objections. "It was used during the Crimean War, with the exception that no straps to assist the bearers were provided at that time. The inconveniences then experienced were twofold; not unfrequently the iron traverse from being too slight for the strains to which it was subjected became broken, and no means of repairing the damage were at hand. More often one or both of the traverses became bent and then there was great difficulty in forcing the two traverses into exactly corresponding lengths, which was necessary in order that both could be hooked into place. The unprotected openings in the side-poles designed to receive the hooks of the traverses, quickly became enlarged, weakening the side-poles still further at those points and leading to the inconvenience of the hooks being easily jerked out of their places. Another serious inconvenience was the want of means of keeping the patient out of the mud or off the hard ground when the bearers were compelled to rest themselves during the long carriage of the patient from the trenches up to camp."

I have ventured to quote this *in extenso* since it so well describes the weak points of a litter, and by indirection emphasizes the good points.

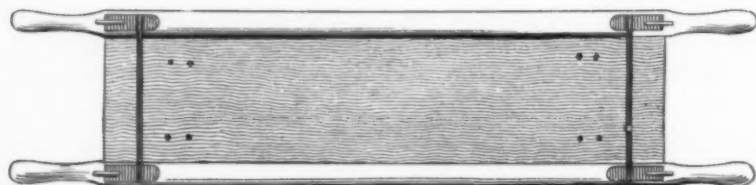
The regulation field stretcher of to-day in the British army is that devised by Surgeon-Major Faris. This stretcher differs from that previously described (as I am informed by the manual above referred to) in the following particulars. The canvas (dyed tan) is nailed to the poles with brass nails through edging of leather; the poles are square and thicker, and kept at the required distance apart by two flat wrought iron jointed bars (traverses), they are also fitted with four rackets carrying three-inch wooden rollers. A pillow and a pair of shoulder slings are also provided with this stretcher. The pillow is wedge-shaped, varying from 3½ inches to 1½ inches in thickness, and is intended to be kept in the new pattern ambulance wagon for use with the stretchers sup-

plied with the wagon: eyelet holes are made in the canvas of the stretcher for the attachment of the pillow to it by strings. The shoulder slings (of leather, 60 in. by 2 in.) are fitted with traverse straps which serve the purpose of confining the package formed by the field stretcher when folded up. The dimensions of this appliance are:

Length of pole,	-	-	-	7 ft. 9 in.
Length of canvas,	-	-	-	6 ft.
Width,	-	-	-	1 ft. 11 in.
Height,	-	-	-	5½ in.
Weight,	-	-	-	32 pounds.



Side elevation.



Plan, under.



MARK V. BRITISH (PARIS) STRETCHER.

The only objections that can be urged against this hand-litter are its weight and wheels, the former is too great and the latter are useless.

THE HAND-LITTERS OF THE U. S. ARMY.*

So far as I have been able to ascertain we fought our great war through with the Halstead litter, and most of us appear to have been reasonably content with the Halstead ever since. This litter belongs to the jointed-brace, folding legs, collapsible variety

*These litters, except the pattern of 1893, are illustrated in the Medical and Surgical History of the War of the Rebellion.

so generally in use to-day, and doubtless was the first of its type. Its dimensions are as follows:

Length of poles,	-	-	8 ft.
Length of canvas,	-	-	5 ft. 10 in.
Width,	-	-	1 ft. 11½ in.
Height,	-	-	1 ft. 2¼ in.

Its average weight complete is 25 pounds, divided as follows:

2 poles (ash),	-	-	-	-	12½ lbs.
4 legs (maple),	-	-	-	-	3 lbs.
2 cross-braces (iron),	-	-	-	-	5 lbs.
2 slings and cross-straps,	-	-	-	-	2 lbs.
Canvas and bolts,	-	-	-	-	2½ lbs.

The legs of this litter are fastened to the inside of the poles by wood screws, and with very little use become "wobbly;" the cross-braces are fastened in like manner to the bottom of the poles, and the stress upon the screws soon loosens the wood about them and they drop out, thus rendering the apparatus useless. They were cheap and we bought more. The slings are of leather or webbing. I have inquired diligently of medical officers who were fortunate enough to have had experience in our last war, as to the use of litter slings, though thus far unsuccessfully; but as there were thousands of pairs of them in possession of the Medical Department after the war, I assume that they were generally used, and being permanently attached to nothing, were generally lost. They too were cheap.

The Halstead is essentially a field-litter, it could not be carried in any standard ambulance wagon, and its use necessitated the transfer of the patient to a special ambulance litter.

Some years after the war a board was convened to crystallize the experience therein gained into a new pattern ambulance wagon.

With this vehicle I have here nothing to do except so far as the litter pertaining to it is concerned. This hand-litter, credit for which is due the late distinguished Bvt. Lt.-Col. G. A. Otis, Medical Dept., U. S. Army, marked a distinct advance in the evolution of the litter.

The Otis litter weighs 20 pounds, its poles and canvas of equal length measure 6 feet, its width is 22 inches and height 8 inches. The handles (telescoping) and legs fit into grooves in the poles, the former, when extended, reaching 6 inches beyond

the ends thereof. This litter was evidently intended to meet every possible indication for a hand-litter under all conditions of service, but that it would do so is entirely problematical. Its fittings are in every respect admirable; the poles are of oak, and the cross-braces of wrought iron are the best I have seen in any litter. The legs are held securely, open or closed, by a spring let into the bottom of the groove, but the telescoping handles play too freely, and are not long enough.

With certain modifications this apparatus might be made a good field litter, but in its present form it cannot be used for general bearer work.

This paper would not be complete without notice of the Satterlee litter, the invention of Bvt. Brigadier-General Satterlee, Medical Dept. U. S. Army, the *avant coureur* of regulation hand-litters in our establishment.

The dimensions of this litter are as follows:

Length of poles,	-	-	-	8 ft. 10 in.
Length of canvas,	-	-	-	5 ft. 3 in.
Width of canvas,	-	-	-	2 ft. 4 in.
Height,	-	-	-	11 $\frac{1}{4}$ in.
Weight,	-	-	-	25 $\frac{1}{2}$ pounds.

From the foregoing somewhat extended review we are enabled to reach a definite conclusion as to the form and material of the ideal military hand-litter.

It must be strong beyond the mere ability to safely sustain its normal load, that it may endure the abuse and hardships of the field. It must be as light as possible, for every pound unnecessarily added to its weight adds unnecessarily to the already overburdened shoulders of the bearers. It must be of simple mechanism, for rough hands and complicated apparatus are not compatible. It must be capable of being folded up into a small compass to economize space and to lessen liability to injury. All its parts must be inseparably connected to avoid their loss, for if not so connected they will certainly be mislaid. And finally, to obviate multiplication of patterns, it must be capable of meeting every requirement under all conditions of service.

Most authorities seem to agree that the poles should be of ash, the bed of hemp ducking, the cross braces of metal, the legs of iron, and the slings of webbing.

Upon the completion of the new pattern ambulance wagon in 1892, the Surgeon-General's office called upon the writer to sub-

mit a model of a hand-litter to be used in connection with it which would fulfill the indications above set forth. I had for a number of years experimented with the various litters which fell under my observation; had made a number combining the various good points of the others, and had striven earnestly to realize my ideal. I need hardly add that I have not yet reached that end.

Several conditions were determined by the ambulance wagon, namely, that the litter must not exceed $7\frac{1}{2}$ feet in length, and 22 inches in width, and that it must have fixed legs.

Another subsidiary condition entered into the problem,—economy,—which demanded that the material of the old litters (a very large stock of which was on hand left over from the war) should be utilized in the new.

I first directed my attention to the finding of a leg light, strong, and suitable. The form finally decided upon was of stirrup shape and which for convenience of description may be divided into three parts.

The pole-piece, a box $1\frac{3}{4}$ inches square to fit over the pole* (This is lightened by having a circular piece taken from the inner and outer sides), the under side of which is called the pole-plate.

The brace-plate $\frac{1}{4}$ inch below the pole-plate, and between which plates plays the cross-brace.

The foot (stirrup shaped) 4 inches high, broad at the base and tapering at the sides to the brace-plate.

The leg is cast in one piece from malleable iron, and weighs $1\frac{1}{2}$ pounds.

Through the pole-piece, pole, and brace-plate, passes a $\frac{1}{4}$ inch bolt (weight with nut $1\frac{3}{8}$ ounces) which secures the cross brace, and which is fastened by a nut below the brace-plate. This arrangement permits of the free play of the cross-brace without danger of loosening the nut.

I am indebted to Capt. Geo. T. Beall, U. S. Army, who had charge of the construction of the litter, and to Mr. P. R. Wagner, of his office, for many valuable suggestions in the evolution of this leg.

The cross-braces are practically identical with those of the

*The poles of the old litters having been pierced near each extremity by two $\frac{1}{4}$ inch holes, it was not deemed advisable to still further weaken them by any attachment of the new leg other than here suggested.

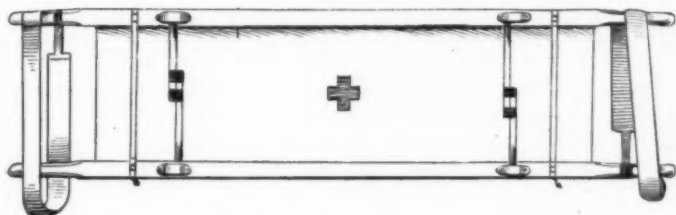
Otis litter; they are of cast steel, (in two pieces $\frac{3}{8}$ inch thick, $15\frac{3}{8}$ " \times $\frac{3}{4}$ " and 12 " \times $\frac{3}{4}$ " respectively,) are hinged at the inner ends, and the longer piece has a jaw which fits over its fellows when the litter is opened, thus strengthening the brace at the point of greatest stress. The pole ends of the brace are flattened, somewhat S shaped, and extend an inch beyond the bolt hole, thus overcoming the tendency of the feet to turn outward. Each brace weighs $2\frac{1}{4}$ pounds. The side-poles are of second growth well seasoned ash, 7 feet 6 inches long, by $1\frac{3}{4}$ inches square. The ends of the poles form the handles 9 inches long. On the left front and right rear handles a half round ring is fixed $4\frac{1}{2}$ inches from the ends, between which and the canvas plays the movable ring of the sling. The canvas is of heavy flax ducking $2 \times 6\frac{1}{2}$ feet, at each end of which an inch is turned over and sewed down, and at each side an inch is turned over the outside of the pole and tacked down, making the canvas 22 inches by 6 feet in the clear.

The slings were proposed to be made of grey woollen webbing $2\frac{1}{2}$ inches wide by $5\frac{1}{2}$ feet long, with a leather lined loop at one end and a leather strap with buckle at the other passing through a steel swivel itself attached to the movable ring on the handle. They were to be permanently attached to the litter, and not removable except by mutilation. This proposition was not accepted, and a snap-hook was introduced which not only neutralizes the object of the slightly complicated attachment, rendering it unnecessary, but makes a cumbersome appliance absolutely certain to result in its removal. The very condition I sought to prevent.

Major Havard, Medical Dept. U. S. A., and myself recently, while revising the Drill Regulations for the Hospital Corps, made careful trial of all patterns of slings that had been submitted to the Surgeon-General, and reached the conclusion that no material for slings, all things considered, equalled woollen webbing, which we therefore recommended for adoption.

Two cross-straps, each with a ring at one end and a snap at the other, play through staples fastened to the bottom of each pole beneath the canvas and near its free edges. When the litter is open the straps lie transversely under the canvas; when closed they are passed around it through the free loop of the slings and fastened to the snaps, thus securely closing the litter. Each weighs $1\frac{3}{4}$ ounces. The total weight of the litter and attachments is 24 pounds.

LITTER PARTIALLY CLOSED.

Bottom*Litter Open.**Side View.*

U. S. ARMY REGULATION (HOFF'S) HAND-LITTER.

*The appliance constructed on the lines described and recently issued by the Medical Department is, I believe, right in principle; it is however imperfect in certain details, as is almost everything before being subjected to trial. Very few things follow the admirable example of Minerva, they must be evolved, and so far at least as sanitary appliances are concerned, the evolution must occur from constant experience with them in actual use.

*As the result of six months' trial of the new litter I believe the following conclusions are justified. The combined leg and cross-brace fulfill their requirements admirably. The only alteration that experience has suggested is the addition of a handle in the shape of an arc, embracing that part of the long piece of the brace extending from the hinge to the jaw. This handle materially assists in opening and closing the litter.

It is not believed that the pole-piece of the leg will be necessary when new poles are used, a simple flange on the inner and outer sides of the pole-plate, reaching a short distance up the sides of the poles, being sufficient to prevent twisting, while the bolt is amply strong with the addition of two small wood-screws, to hold the leg in place.

The poles of the regulation litter have been in such manner reduced to receive the

legs, as to leave the pole-piece projecting beyond them on all sides, which of course will cause the canvas to give way at that place. The pole should be dressed down from the handles back to the seat of the legs; this would leave a shoulder, and so much of the pole as lies between the legs would be flush with the upper surface of the pole-piece. The short space, top and outside between the handle and leg, after the latter has been slipped into place, should be filled in with thin strips of wood glued in place, thus, as it were, counter-sinking the pole-piece of the leg into the pole. One inch at each side, by one-half inch at the bottom of the pole, should be chamfered off between the legs, and between each leg and handle: this fully compensates in weight for the additional material used in counter-sinking the legs, and gives an appearance of lightness to the apparatus.

I have heretofore stated that the slings as issued are thoroughly unsatisfactory. The following described sling will meet most of the requirements of this appliance. Its parts are:

Best quality woollen webbing, $2\frac{1}{2}$ inches by 6 feet, 5 inches of one end of which is turned up for a loop, which is lined with leather.

Fair (harness) leather strap, 1 inch by $4\frac{1}{2}$ inches.

Metal belt slide, 1 inch by $2\frac{1}{2}$ inches, by which the length of the sling is adjusted.

Metal sling-plate, 1 inch by $2\frac{1}{2}$ inches, to which one end of the strap is fastened, and through which the webbing plays.

Metal ring with bar (1 inch long), or swivel, riveted to the ring handle of the litter $4\frac{1}{2}$ inches from the free end, and to which the other end of the strap is attached.

It will be observed that this sling is of extremely simple construction. The strap permanently attaches the sling-plate to the fixed ring on the handle of the litter. The sling plays through its plate and is fastened to its slide exactly like an ordinary belt.

Following the suggestion of Major Havard, Medical Department, U. S. Army, I have placed the cross-strap on top of the poles immediately beneath the canvas. My plan of attachment is as follows:

The free end of the strap is counter-sunk into the side-pole 7 inches back of the free edge of the canvas and securely tacked; the other end passes through a groove on top of the opposite pole and is brought out through a staple at the side just below the edge of the canvas. When the litter is open the D ring only is seen at this point; when "strapped" the cross-strap passes beneath the litter, around up over the canvas, through the loop of the sling and is secured beneath the pole (with the ring-handle) to a strong stud, placed near the leg. This method of fastening is found to be much more satisfactory than is that with the fragile spring snap now used. It will be observed that the free ends of the straps correspond with the ring-handles of the litter.

POST RECORDS.*

BY LIEUTENANT CHARLES DE L. HINE, 6TH U. S. INFANTRY.

WHILE serving as the only lieutenant at a one-company post it was the good fortune of the writer to be left for nearly a year without any enlisted men available for clerical duty in the adjutant's office. Accordingly the adjutant did his own work, and after learning its practical details tried to find out how much of it was actually necessary, and what portions could be eliminated without detriment to the efficiency of administration or the completeness of records. He succeeded in cutting down the work in its various branches by from one-third to more than one-half, without transcending existing regulations or encountering the disapproval of superior authority. In accordance with the general principle that it is usually easier to do anything than to study up ways not to do it, this involved during the first few months, considerable extra labor. This was compensated for, however, by the amount saved during the other months, to say nothing of the labor-saving knowledge on hand for future service. It was of course necessary to obtain the approval of the post commander at every step or the proposed changes might have come to an abrupt termination.

From conversations with many officers and from inquiries at a dozen or more posts, the writer finds that there is practically no difference in the detailed methods of keeping the records. He does not intend to criticise those methods or to theorize as to what might, could, would, or should be done, but simply to narrate what has been actually done at one post, and to show that the same principles apply to every post, whether it be garrisoned by a company or by a regiment.

Orders and communications are put in writing, (1) for persons who cannot be reached verbally, (2) where the importance of the subject matter demands a higher degree of accuracy than spoken messages contain, and (3) to preserve an intelligent record of the transaction for future reference.

The prime essential of a record is that it shall be so clear and

*Read before the Lyceum at Fort Thomas, Kentucky.

complete that, supposing years to elapse and all the parties to be dead, it will be possible to ascertain exactly what was done in any particular case. In the case of official letters emanating from a post it is wisely prescribed that the "letters-sent" books shall contain all letters in full. The only way to reduce the amount of work in this book, then, is to reduce the number of letters sent. This was readily done at the post in question. When a communication was not required to be in writing by at least one of the considerations above enumerated, it was made verbally. Thus if a slight change in the routine of the day was necessary, involving perhaps the sounding of a call at a different time from that laid down in the schedule, orders were given verbally, provided the change was for that day only. When it was thought necessary to have a record of the occurrence a brief entry was made on the next consolidated morning report, or, in the case of a call, on the guard report.

Life is too short to put trivial matters in writing, and an office that is overburdened with useless written work cannot cope successfully with emergencies. It must be remembered that armies are maintained to meet the unexpected, and when that arises the office work must not be delayed or the object of our highly organized system will not be fully realized.

By the omission of "Your obedient servant" from the letters and the book, six words were saved in the writing of every letter. For some time past all letters coming from the Adjutant-General's office have contained only the "Very respectfully" in the ending. The Adjutant-General's is necessarily the most military of the staff departments, and in such matters as correspondence fixes the standard for the rest of the army. The letters that it sends out every day are its real models, any variance from so-called models heretofore distributed to the contrary notwithstanding. Acting in nine different capacities the writer has mailed several hundred letters without "Your obedient servant" and no exception has been taken thereto. The time may come when "Very respectfully" also will be omitted, and letters signed like endorsements.

The greatest decrease in letters sent was made by using no letters of transmittal except in rare cases where peculiar circumstances made them necessary. It may be news to some officers to know that many of the letters of transmittal that reach the War Department are immediately consigned to the waste basket.

It is the enclosures that are important. The letter is no more so than the envelope. Where a great many reports and returns are mailed under one cover, a slip containing a "memorandum of enclosures" is useful. It answers every purpose of verification. The record of these transactions was kept under the title: "Reports, etc., Mailed." Columns were ruled for the headings: 1. Date. 2. Paper. 3. Number of Copies. 4. To. 5. At. 6. By (name of person actually mailing). 7. Remarks. The more common factors we take out of the parenthesis, as it were, the simpler will be the operation. Instead of writing and copying a formal letter of transmittal, the following concise entry in the columns gives all necessary information: "Dec. 31; M. & P. Rolls; 8; Maj. John Doe; Chicago; Roe; Back and paid Jan. 5." This record can be kept on a few pages at the beginning or end of the letters-sent book.

More difficulty was experienced in reducing the "letters-received" book, for the reason that other people did not reduce their letters sent. The letters-received book was the endorsement book, and the work was curtailed by shortening the endorsements on papers "going down," in a manner similar to that used in referring papers to the different departments at a headquarters. Purely routine papers had no "respectfully transmitted," no "by order," and no adjutant's signature. All that was put on the paper or in the book was, for example, "1st Endorsement. Fort Someplace, Feb. 29, 1892. To Post Quartermaster." This work was greatly facilitated by the use of rubber stamps. Where any material remarks were made or orders given the endorsement was formal and signed. In the matter of endorsements the army has a concise, logical system that is infinitely superior to the cumulative letters method of the business world.

The post order book showed the greatest decrease of any record at the post. The number of post orders was cut down from about ninety per year to less than thirty. A standing order was issued that muster should take place on the last day of every month at the time appointed for guard mounting. Thereafter no monthly order for muster was issued, but a verbal reminder was given at first sergeant's call on the day previous. Unlike an order for travel, for transportation, for commutation, or for extra duty, an order for muster is not a sub-voucher to any fiscal transaction. Why, then, have an order for monthly muster any more than for weekly inspection? The time must be fixed, but that

can be done as above stated. The dress to be worn must be indicated, but that can be done by verbal orders in ample time. In these days of printing presses, when it frequently takes a day or two for an order to be drafted, printed, and distributed, the weather has great opportunity for change between the time that an order is given and the time that it reaches the persons affected. An entry on the morning report book preserves a sufficient record of the fact of muster, and if thought necessary for the information of future generations the hour and dress can also be included.

Another standing order enumerated the legal holidays and directed on those days the suspension of all duties except roll-calls, guard and police. This saved issuing an order for each holiday. It was not found necessary to remind men of the order. The fact of observance was noted on the next morning report.

Still another standing order provided that when the guard-house thermometer was below forty, formations should be in overcoats. In a similar way all the standing orders of the post were codified and published in an order as the post regulations. These regulations will have to be revised and republished every year or two, or as often as may be required by the accumulation of the inevitable additions and modifications, or by considerable changes in the personnel of the command.

The post regulations as well as the drill regulations formed a part of the instruction of recruits. All were therefore instructed that when detailed on special or extra duty they were sent by the captain or first sergeant to report to the officer in charge of the department, and that when relieved they should report for duty with their companies. Orders for these details were shortened by omitting the usual phrase, "and will report to the post quartermaster for orders," or "and will report to his company commander for duty." The word "hereby" was also omitted where no ambiguity could arise. It is frequently necessary after such words as "in place of," "vice," etc., but is usually superfluous before such words as "detailed," "granted," etc. A perusal of the special orders from the Adjutant-General's office will show many precedents for the omission. Men were detailed on special duty by verbal orders.

Orders giving the list of calls were not published at stated intervals but only when changes were made. The times of sunset for the days of each month were entered on a sheet and the twelve sheets placed in a picture frame with a hinged back. A

frame was hung in the guard-house and other important places. At the end of the month the sergeant of the guard takes out the old sheet and puts it at the back of the frame, so that the sheet for the new month appears. For all practical purposes those will last for several years and the labor of publishing them over and over again is saved.

When an order from department or army headquarters was received, the first thought was not how to obey it by issuing another order, but to see if, with verbal help, the order would not execute itself. Take for instance the case of a man transferred at his own expense who did not desire the Government to advance his transportation. Here a copy of the order of transfer was a sufficient travel order. The morning report showed him from duty to transferred per such an order. This, with the order on file to be referred to if necessary, made short but complete record. To spread another order on the post order book would have been an unnecessary duplication of records.

In tracing an individual or a transaction the post order book is not the first record to consult, but the last. The morning report book is the first, and if more detailed information is desired it tells where to look next. Beginning with the company morning reports the record of events must be so complete that the post morning report will afford the clue to all happenings at the post outside of the usual routine. The authority for each alteration, whether letter, endorsement, or verbal or written orders, should be cited on the morning report except in the simple cases of "duty to sick," "duty to confinement," etc. Sentences of summary courts, etc., should also appear. When a man is first taken up, and again when he is finally dropped, his full name should be given. With the system of abbreviations in general use all these entries take up a surprisingly small amount of space. When they are correctly made, the proper morning report book with the retained paper of the preceding month contain all the data necessary for the preparation of a muster roll, a company return, or a post return. These last are, broadly speaking, merely amplified morning reports for the information of higher commanders. If a morning report is not allowed to be dwarfed by less important records it is the most beautiful part of our system. It is the most indispensable both in garrison and in the field. It contains very complete information stated with a military conciseness that is as pleasing as it is useful.

The present policy of the War Department seems to favor a reduction in the number of orders. It has decided against the publications in orders of the findings of a summary court. It is also stated that no order is necessary detailing or announcing the summary court. The law appoints the court and again the morning report comes in, this time to show who is second in rank for duty. Paragraph II, Circular 7, A. G. O. 1892, provides that when a recruit is enlisted for a particular company no order of assignment is necessary. It is well to take such hints as these from superior authority as a guide for action in other matters. Otherwise subordinates may find themselves attributing a sudden curtailment of their authority to the centralization system, when in reality it is due to their own failure to read the handwriting on the wall.

The slight opportunities for service in the staff departments in this period of large posts has been well commented upon by an artillery officer in a recent number of the *United Service Magazine*. He advocates the detailing of second lieutenants for short tours of actual clerical duty in the different offices at a post, and compelling them to do the work without assistance. When some such plan is adopted our officers will be much better trained, for one can learn more by making out papers for two or three months than he can by supervising their preparation for as many years. Records will then be simpler, for officers will have sufficient confidence in their knowledge of paper work to be able to depart intelligently from beaten paths before these become worn into ruts.

HINTS ON TRAINING AND INSTRUCTING DRIVERS FOR FIELD ARTILLERY.*

BY LIEUT. ELI D. HOYLE, 2D U. S. ARTILLERY.

AT first sight this subject may appear very limited and, perhaps, insignificant, but it is believed that a closer examination will show its real importance; for the training of the driver includes the training and handling of the horses—a most important matter in the instruction of the battery. I have not proposed to myself to write an exhaustive treatise on the subject of drivers, but merely to throw out a few simple hints, which it is hoped, may meet with approval. I shall therefore pass over that part of the instruction of the driver which concerns the evolutions at drill, and that relating to the general care of the horses and harness, and confine myself to that instruction and training which is meant to insure the proper management and handling of the horses and the conservation of their strength when in draft.

No battery can be efficient in the field unless it be provided with good drivers. The weak link in the battery chain in war is the mount. We may reasonably hope to be supplied with good guns, material and men, but suitable horses will be scarce and hard to replace. It therefore behooves us to consider well how we may get the most work, and the best, out of our horses, and to our drivers we must largely look for this desirable result. Even the best horses, with the best drivers, under conditions of hard service will rob the anxious captain of many a much needed night's rest, when, so far as the men, guns, etc., are concerned, he could sleep with a light heart. One bad driver may cripple a section, two a platoon, and six a battery, and a majority of bad drivers will turn a battery into mere impedimenta whenever a very severe strain is put upon it.

There will be found in most batteries a few men whom nature has formed for foot-duties only. They know their limitations, which are patent to the whole battery, and these men should never be put upon a horse's back. Happily, however, the great

* Read before the Artillery Officers' Lyceum, Fort Riley, Kansas.

majority of men can, with time, care and patience, be made fair drivers—some among them good drivers and some excellent.

Let us now proceed to consider the training of the driver *ab initio*. In the first place he must be made a horseman. This is the prime consideration. Our new Drill Regulations (school of the soldier mounted) prescribe excellent exercises for obtaining this end. No time, labor or pains should be spared in making the soldier a good rider, the finer the better. Every fault of the man should be patiently and persistently pointed out and corrected until cured, and, as a stimulus to his exertion, he should be made to understand that his drills, especially *extra* drills, will be kept up until he conforms to the instruction. His seat, the carriage of his head, body and legs, and the proper use of his bridle-hand, should receive constant attention. A "can't-do-this," or "can't-do-that," must be subjugated by the "must-do" the right thing. I am a firm believer in extra drills for the purpose of making up a man's deficiencies.

It is hard on a draft horse to carry even the best driver, but when it comes to carrying a lout, who sits more on one side than the other; or who rides stiff-legged, depriving the horse of the proper support and guidance of the legs; or who turns the toes out and the spurs in; or who carries the body awkwardly and stiffly, disjuncting the horse in his gaits; or who—most heinous of all crimes—rides on the bit, torturing the horse at a walk and crucifying him at the fast gaits; the poor animal is indeed to be pitied. Nor can we stop at pity; the horse, constantly subjected to one or more of these outrages, has his days of usefulness lessened and in a tight pinch goes under alongside a still efficient companion, no whit his superior except in having a better driver.

Now let us consider the team hitched, and:

1st. The Start.—The drivers should move their horses together, slowly and gradually, giving them time to throw their weight into the collars and overcome, by a steady, increasing pull, the inertia of the carriage. Anything jerky or showy in starting a team, whatever the gait, is out of place. The initiative of every start should be taken by the lead driver, and as the swing and wheel drivers see the traces straighten out in front of them they move their pairs forward, all acting in unison, like carefully stretching a long rope. Once the wheels start, everything should go smoothly. Horses accustomed to this do not dread a start; all others generally do.

2d. *The Halt.*—To halt, the horses should be brought to a stop gradually and gently, without jerk or shock, traces slackened from front to rear, the impulse of the carriage being mostly absorbed by the friction of the wheels.

These two points—the start and the halt—may appear of little moment, but I have noticed that but few drivers habitually execute them properly, and their very frequent repetition makes them important. The tendency is for the wheel-driver to make his pair move first, and thus start the carriage before the front traces are stretched, and in halting, to rein back too suddenly and thus halt too short, both, of course, at the expense of his horses.

3d. *Changes of Gait.*—These should always be made gradually and never by forcing the horses forward, or checking them, suddenly. The average horse passes easily and naturally from the walk to the trot, from the trot to the gallop, and the reverse. To increase the gait the driver has but to press the near horse with his legs; the off-horse will nearly always quickly conform to the gait of his mate. It may be necessary to move the hand towards him or threaten him with the whip, but very seldom to strike him. In decreasing the gait the pull on the reins should be applied gradually, without jerk, and the horses given their heads as soon as they obey. Our present bit (the Shoemaker) is cruel, especially for draft horses, and the drivers must be trained to ride with a light hand in order to secure smooth work and save the horses.

4th. *The Walk.*—This most important gait for artillery horses should be carefully considered. Drivers should be trained to keep their horses at a brisk walk on the level and descending gentle slopes, but always to move slowly up-hill,—the steeper the hill the slower the movement.

Ascent of Hills.—Nothing is more hurtful to the horse than rapid motion uphill. If the hill be long and steep he arrives at its summit blown and badly worried, the heart is over-worked and his reserve force lessened.

Poor drivers appear to get nervous as they approach a hill and this nervousness is communicated to the horses. These drivers, as soon as the ascent is begun, begin urging their horses, like as not using the whip and spur, and they are lucky if on steep hills the team does not balk and let the carriage run backward, dragging the team with it and throwing the whole column into disorder.

In going up-hill the best driver will sit quietly in the saddle, avoid every unnecessary movement and allow the horses to go as slowly as they wish. Such drivers will bring a team to the top of a hill in prime condition and ready again to take up the brisk walk. Whoever has seen a good six-mule, or ox-team toiling up-hill will understand my meaning. The average rate of marching of teams driven as indicated will be satisfactory and, what is more, the horses will thrive under any fair demands on their strength.

Descent of Hills.—As our carriages are not supplied with road-brakes* (as I think they should be) in going down-hill when the wheels are not locked, the carriage must be held by the wheelers at the gait of the team. Holding back is hard work on the horse and everything possible should be done to relieve him. On almost every road there is a smooth beaten track and alongside it a wagon space, more or less rough and soft. The latter should be used by artillery in descending hills of any importance in order to relieve the wheelers by transferring the push of the carriage to the soft earth and irregularities of the unused part of the road. Where the road descends through a cut, a limber wheel may be made to graze or infringe lightly against one of the banks with like effect. Drivers should be trained habitually to conduct their teams as indicated without awaiting direction from any one.

5th. The Trot.—The manœuvring trot of 8 miles to the hour is not very fast and almost any horse can soon be taught to make it. I regard it as ill-advised to go so fast at the trot as to force some of the horses to the gallop. Where a driver's saddle-horse is frequently seen galloping when the battery is at a trot, it will often be found that the rider prefers the easier gait, and it is a good plan to mount him on some well-trained pile-driving trotter.

6th. The Gallop.—Untrained drivers appear to lose their wits whenever they hear the command to gallop. They should be practised at this gait sufficiently to teach them to hold their horses well in hand and it requires no little practice to attain this.

There is scarcely a better test for good drill driving than the proper execution of the countermarch, reverse, and the abouts, at the fast gaits, for it is a hard matter to get the drivers to open out the loop, or increase the radius, and *especially* to moderate

*The Ordnance Dept. has issued (December, 1893) to each of the batteries at Fort Riley, for service test, a new model caisson with road-brakes.

the gait. If trotting they should be instructed to take the *slow-trot*, and if at the gallop, the *canter* during these movements. They seem to understand this better than the phrase "moderate the gait."

7th. Driving Dismounted.—Drivers should frequently be dismounted and trained to control their horses on foot, and on the march they should be permitted to dismount at will (except the wheel-driver on going downhill). This practice relieves both the driver and his horse.

8th. Riding the Off-horse.—It will be found useful to accustom the drivers to manage their pairs while mounted on the off-horses. I believe in working the horse on both sides, but it may happen on a long, hard march that there is not time or opportunity to change, and still, by the practice suggested, the work of the horses may be more or less equalized.

9th. Commands.—An important element in the training of drivers is the proper giving of commands. Infantry commands, or anything like them, are entirely out of place. My experience is that not sufficient attention is given to this matter by officers, and that many commands are faultily given by non-commissioned officers. The commands should always be prolonged, suited to the movement and gait and well timed. Uniformity in a battery in giving commands is very desirable. It is believed that intelligent horses will learn a good many commands whether by voice or bugle, when given uniformly. Commands given in an excited tone of voice affect both drivers and horses injuriously and, notwithstanding such commands may be considered very military, they should not be indulged in.

The command, "1. Forward, 2. March," should always be well prolonged and without much pause between the two words. It is very objectionable to give the command "Forward" and then wait some time before giving "March"; for some horses will start and must then be reined back and started anew, and both drivers and horses will be disconcerted and the movement ragged. Similarly the command, "1. Battery (Platoon, etc.), 2. Halt," should always be well prolonged, more at the fast gaits than at a walk, and so timed that the horses shall never be pulled up short.

I consider it especially unfortunate that the "Halt" by bugle consists of a single note, and it is a well trained battery in which no horses suffer from bit and breeching at a bugle halt. "1. Ac-

tion. 2. Rear," is another example of a command that must be well prolonged, and also well timed, to insure a smooth halt at the proper place. Considerable practice is necessary to attain this.

Those bugle signals which are, as it were, musical syllables corresponding with the words of command, should be prolonged as are these words by the voice. Such are "Forward," "Right (or left) oblique," "By the right (or left) flank," etc., and always the command "March."

My experience is that bugle calls are generally sounded too sharply. It is useless to expect the drivers to handle their horses well unless the commands be properly given and properly timed. In forty-nine cases out of fifty at drill, when a battery overruns the line the fault is in the command, and generally in such cases the horses are punished either by being pulled up too short or forced to back into place.

The following are some of the faults noticed among drivers in my experience:

1. Riding stiff-legged, with the knees straight and the feet projecting forward and outward. This is the seat sometimes described as "tongs upon a wall." Such a rider manages his horse entirely by the reins and, consequently, imperfectly. Besides affecting his equilibrium the horse is deprived of the valuable aids and support of the legs. It is rather difficult to break an old soldier of this bad habit.

2. Riding with a heavy hand, or constantly pulling on the reins. This kind of a driver is usually a poor horseman and seeks to sustain himself in the saddle at the expense of the horse's mouth. At the fast gaits his bridle-hand, instead of being kept steady, is seen jerking about more or less wildly, while his horse shows the punishment he is undergoing, elevates his head, tosses it about jerkily, is disjointed in his gaits and generally covered with sweat. This driver seldom slackens his reins, even at a halt, and seems determined to keep his horse "on the rack." According to his own statement he is always mounted on the worst horse and the hardest in the battery. He may sometimes be cured by a long course in the school of the soldier mounted, but an old soldier who rides on the bit might as well be dismounted permanently.

3. Occasionally is found a driver and a well-meaning man who has not the faculty of balancing himself equally in the saddle.

He cannot tell when the stirrups are of unequal length, sits more or less on one side, and commonly carries his legs differently on the two sides of his horse. Parting his hair in the middle seldom cures him. He is a maker of sore backs and should be dismounted. If any properly instructed man be detected carelessly or purposely committing this fault, he should be punished up to the limit of the captain's power.

4. Some men of nervous temperament make very poor drivers. Apparently they *must* do something all the time and cannot be still in the saddle. One man will swing his legs back and forth with every step, continually thumping his horse. Another will be seen constantly moving his bridle-hand forward and back, urging the horse under him and threatening his off-horse continually and unnecessarily. If a wheel-driver, he makes his pair do pretty much all the work of the team. He is a poor hill-climber. He seems to fear that he will never reach the top, and begins to kick, threaten and even strike his horses the moment the ascent is begun, apparently under the delusion that unless the hill be taken with a rush it cannot be taken at all. This driver is a horse-killer and should not be allowed to practice on Government stock.

5. A bad driver, frequently seen, is he who always pulls his horse up short and endeavors to make a dead stop at the command to halt. He is generally ignorant and yields to instruction, but he should be put on the list and closely watched. It is a pity he could not himself be halted a few times with the Shoemaker bit, vigorously applied, as an object-lesson.

General Remarks.—The drivers should be assembled in barracks from time to time, and their faults, the principles of the drill, and the correct method of handling and managing their horses, explained to them. This will save much time and lung-power on the drill ground, where explanations are often but partly heard and imperfectly understood.

An artillery driver, who must ride one horse and manage another, both of which are hitched to a heavy carriage, and this at all gaits, has a more difficult work than a cavalry soldier and should be a better horseman.

Kind treatment of the horses must be insisted on and, as they are controlled by signs, the drivers must be taught to give them time to interpret these signs.

In crossing little hollows I believe it is easier on the horses to

let them trot going down, at least the last few yards, and allow the impulse of the carriage to start it up the other incline.

If the horses balk, the drivers should be taught to swing the team sharply to the right or left, as may be most convenient, the lead driver selecting the direction. If going uphill this will hold the carriage in place and, in any event, it will be found that the team will generally pull in the new direction.

Great care should be taken that the teams pull evenly and steadily and that each pair does its fair share of the work at all times.

The captain should frequently point out to the chiefs of platoon the defects of their drivers, and let them know that he holds them responsible for the correction of all faults. The lieutenants for their part should keep the drivers under constant scrutiny. Once a battery is blessed with well trained drivers it will require constant attention to hold these up to their work and train new ones, and the captain must, for this purpose, have at least the hearty coöperation of his lieutenants.

So far as my observation goes lieutenants are in battery matters the most modest men on earth. A single suggestion ill received by the captain may close a lieutenant's mouth forever. Should the captain be thought jealous of authority and desirous of keeping the bulk of the same in his own hands, I warrant his lieutenants will let him do all his own work and much work of theirs too with an appalling indifference. In fact, the captain must distinctly and constantly encourage and support his lieutenants in order to get the best service out of them. Nowhere is such encouragement and support more necessary than in a light battery, and in nothing is the result of such action more manifested than in the efficiency of the drivers, which is a large factor in the efficiency of the battery.

THE POST MESS.*

BY LIEUT. C. J. T. CLARKE, 10TH U. S. INFANTRY.

BY a Post Mess for enlisted men is meant the combination of the various companies or units at a post, for messing purposes. While this new system has only been introduced at regular posts during the past few years, and may therefore be considered as still in its experimental stage,—so far as applied to the posts where in operation and thus to the line proper of our army,—the plan is by no means new to us. As early as 1887 a common mess was in operation at the recruiting depot on David's Island, N. Y. H., and was later adopted at Columbus Barracks, another of our recruiting depots. These two it is believed were the first authorized messes of this character.

The system was highly favored by the Quartermaster's Department for its alleged economical aspects; in that where in operation it did away with a great many separate kitchens and their necessary outfits, and made possible, with the usual amount of money spent in an ordinary barrack building, more space, larger dormitories, day-rooms and non-commissioned officers' rooms, not counting many other conveniences and comforts, considered out of question in a barrack encumbered by company kitchen and dining hall.

In making this claim of economy in favor of this institution, the cost of erection of general mess halls with their extensive steam plants seems to have entirely escaped consideration; for it was thought, after this brief experience at depots, that the system would be of inestimable benefit to the enlisted men at permanent garrisons, and as a result of this recommendation (and others of the kind), it was determined to adopt the method at some of the regular posts then in existence and about to be built.

The fact of the cooking and messing arrangements being on a larger scale and different from those of an ordinary company mess, and therefore from their very nature entirely unsuited to time of war or to field service, appeared to receive little if any

*Read before the Lyceum at Fort Leavenworth, Kansas, February 12, 1894.

attention at this time; as did also the important principle of considering the company mess in garrison as a preparatory school to the field mess, while the expensive post mess proposed could be a preparation to no other, and while perhaps successful as a feeder, could in no sense ever become an educator.

For the purposes of this paper it will not be necessary to recite the establishment of the general mess at many of our regular posts.

Like many other so-called reforms in army administration, this one has come to us heralded in advance by many as a success, even before receiving practical exemplification; while on the other hand we find many opposed to the venture and liberal in their abuse of this apparent offspring of misdirected economy, even before it has been given a chance to breathe at all. To condemn an innovation of any kind, without first carefully studying its imagined benefits and seeming defects, is not wise, nor is it always politic or discreet; but in this instance it would seem that the objectors to the general mess system as applied to regular posts, were justified in prejudging an institution whose very characteristics are so essentially different from the principles aimed at during times of peace, whether they be in matters of army organization, drill, discipline, or supply.

As applied to recruiting depots the system is not only perfectly feasible, but is admirable in every respect. At such places there is really no company organization whatever,—except for discipline and drill,—and there is not, at any time, a likelihood of these companies being called upon for active service of any kind. In questions of supply all companies at a depot are really as one organization. They are, moreover, subject to constant change by men joining and departing from depot, which alone makes the company mess far less desirable than the consolidated mess for these depots.

Having conceded the system under discussion to be a proper one for recruiting depots and like places, let us now turn to the subject in its relation to regular posts. Among the many advantages cited in favor of the new scheme over the company mess are:—

1st.—A more economical manipulation of the ration, on the principle that the greater the number of rations handled the smaller will be the percentage of waste.

2d.—The advantage of serving an entire command with exactly the same kind of food, both with reference to quality as

well as quantity ; thus eliminating all irregularity, in this respect, among different companies at the same station.

3d.—Simplification in matters of supervision, garden management, and accounts.

4th.—Reduction in the number of men required for duty as cooks and kitchen police ; and,

5th.—The lessened expense to the Government.

So far as the first advantage is concerned, practical application shows not only its truth, but demonstrates beyond question that in a general mess the "savings" are proportionately larger per company than they are in small messes.

Considering the second advantage, it must be confessed that it has great merits, were it not that the subject is of greater importance than even the contentment among the men claimed to be produced by this general diet plan, although this latter is perhaps worthy of thought.

The question of simplification in supervision and management is, to my mind, of small weight compared to the importance of having the company commander personally superintend the feeding of his men at all times. While undoubtedly lessening his burdens, the fact must nevertheless be plain, that the general mess plan takes from the company commander one of the most important functions of the interior economy of the company.

A company commander's greatest care is (or should be) the proper administration of its messing arrangements. He should know exactly what can be, and is done, with the different components of the ration, which includes a knowledge of parts to be "saved" for conversion into other articles of food for the benefit of the mess ; and in fact, if a successful company commander, there will be nothing in this particular and vital function of administration with which he will not be thoroughly familiar.

Enlisted men naturally look to their company commanders in all things, as they should, and as they are taught to do. From their entry into service they are impressed with the fact that their officers will, in every way, provide for them and protect them from unnecessary danger and labor, and it has been aptly said, that when "Men know this they face hardship and danger uncomplainingly, knowing it to be inevitable."

Of necessity then these conditions, instead of being weakened should be strengthened. This fact imperatively demands that officers shall be taught by actual experience and contact how to

care for their men, and the thought comes to me, that right here lies the mistaken policy of the post mess system.

If universally established we shall, in not many years time, have few officers with sufficient knowledge of how to care for their companies when occasion arrives, because they will have spent the quiet times of peace at large posts, and there subsisted under the protecting wings of the government boarding-house system. It is true there are regulations in existence requiring companies living at a general mess to go into the field from time to time, for the purpose of receiving instruction in field-cooking. But these are rarely if ever carried out, and if they were, the benefit derived would be small, from the short time which would be allowed for the work.

Many advocates of the new system appear to lay great stress on the dissimilarity between the method of cooking employed at a general mess and the one usually followed in the field; but they fail to bear in mind that, while the garrison and field ration may differ in some essentials, the handling and disposition of the ration is exactly the same, no matter what the manner of preparation may be.

The subject of the soldier's ration, although worthy of and entitled to separate thought, may well be referred to here, for it is closely related to our theme. Experience of both peace and war has, it is said, demonstrated that the full army ration is sufficient, provided the soldier receives the benefit of the whole of it. This may be true, but the actual results of the past many years of peace, would seem to throw considerable discredit on this statement. Instances are known where one of the principal components of the ration allowance was doubled, and yet, even with vegetables and other substantials, both solid and liquid, was complained against as not sufficient; not so far as life sustaining qualities were concerned, it must be admitted, but as an appetite satisfier.

Hard workers are supposed to require more food than the idle, but the reverse of this appears to be the case at present in our service, for experience conclusively shows that the less done by our troops the more food they demand.

In support of this it may not be out of place to state that at this post, during the month of January last, the enlisted men consumed daily an average per man of $1\frac{5}{8}$ lbs. of fresh beef and salt meat (Gov. allowance, $1\frac{1}{10}$ lbs.), together with $3\frac{1}{2}$ lbs. of bread,

vegetables, coffee, sugar, etc. (Gov. allowance, $2\frac{1}{2}$ lbs.), an increase for the entire mess of 9760 lbs. of meat and 18,600 lbs. of bread, vegetables, etc., over and above the regulation allowance.

The almost constant changing of the material in the ranks accounts, in no small degree, for this condition of hearty appetite. Whether or not this be the real reason, or whether there be a deeper one assignable, it is a fact nevertheless, that the ration does not appear adequate, either in quantity or in quality for the class of men now coming into our service.

Many suggestions concerning a modification or increase of the ration have been made from time to time, some recommending the exclusion of barrelled pork and the substitution of bacon, others an increase of the flour ration, and so on indefinitely; and it would appear to be desirable to make such changes as are clearly shown, from practical experience, to be conducive to the betterment of the soldier's fare, thus adding to his contentment of mind and consequent satisfaction with his surroundings. As a suggestion, the meat ration might be made $1\frac{1}{2}$ lbs. daily, to consist of $\frac{2}{10}$ fresh beef and $\frac{1}{10}$ pork, the former to be interchangeable with fresh pork, mutton, or other kinds of meat, when procurable or desired; while for field service $\frac{3}{10}$ bacon and $\frac{7}{10}$ beef might be issued. Bread at the rate of 20 ounces per ration; beans at the rate of 20 lbs. per 100 rations, instead of 5 lbs.; rice, 15 lbs. to 100 rations instead of 10 lbs., or split peas in lieu of rice, 2 lbs. to one, when wanted, would, it is thought, be changes most welcome. Except in the allowance of fresh vegetables, which should be increased to $1\frac{1}{2}$ lbs. daily per man, the remainder of the ration is ample.

The addition to the field ration of both desiccated vegetables and beef extract as now procurable in a semi-solid state, is by no means a new thought, and should be carried out. The field ration lacks the anti-scorbutic necessary, while a beef tea, made of the recommended beef extract with either hot or cold water, is refreshing as well as strengthening. Indeed both of these articles might, at times and to advantage, be issued in garrison as well.

Careful observation would, it is true, indicate that as a rule our men in garrison eat, not only more than is necessary, but more than is proper for health's sake. However, as there has been no pronounced increase in the sick reports at places where the generous diet system is in vogue, this conclusion must be accepted as one

entirely of theory alone and not of fact. As a plea for an increase of the ration where needed, it might be well to remember the time-honored saying that, "Armies move on their bellies."

A distinguished writer once remarked, that "No man can be wise on an empty stomach." Add to this, "Nor can he be contented on either an empty one or an improperly supplied one," and we have a valid reason for making changes of any character which shall tend towards contentment and thus materially aid in discipline.

Before dismissing this matter it may be well to emphasize the thought, that while our ration may be at least equal to that provided for any army in the world, this fact should not be a bar against modifications, if experience and changed conditions make it plain that such are imperative.

In close relation to the matter before us, is the subject of cooks.

To insure health and efficiency in troops, their food should be properly cooked. There is nothing more injurious to men than unwholesome food, brought to that state by bad cooking.

Many of us know from experience how the present method of making cooks by detail works (although a step in the right direction was taken when extra pay was authorized for these artists), and how it is more often "pot luck" than any other phase of good fortune, which brings a good cook to the kitchen. Like other classes of workmen,—or professionals, if you please,—cooks are sometimes, it is true, found in our companies, but not often enough to give all organizations efficient ones, and this notwithstanding the extra pay inducement temptingly held out.

It is hardly possible that any circumstance could make it desirable or essential that all, or even a majority, of the men in a company should be cooks. This would be as unnecessary as having one's whole company expert telegraph and signal service men. But the fact must be patent to all who have studied and practically applied themselves to this important function of company management, that the enlistment of a trained cook for every company at a good rate of pay, together with careful supervision, is the proper solution of this question which is of such interest to the health and efficiency of the enlisted man.

Having secured the trained cook, the instruction of men showing an aptitude and inclination for this work could then be given under proper rules, but the theory of making cooks without

efficient instructors in the art—as one might instruct in ordinary fatigue duty—is radically wrong, and such experiments would in most cases play havoc with the mess-chest, if they did not indeed bring dire distress to the military stomach thus experimentally operated upon, and through it, evil results to the military body itself.

Having referred, although briefly as well as imperfectly perhaps, to the two closest relations of messing, let us now return to the subject matter of this paper.

Inquiry and investigation show the enlisted man himself as opposed to the general mess system.

Among the many objections advanced by him in support of this opposition are:—

1st.—That it interferes with comradeship and the close relation among men only possible at the company mess table.

2d.—That cooking by the steam process is not so agreeable as the method ordinarily used, and that as a result he grows tired of the cooking, which in time (and particularly in some instances) becomes unpalatable to his taste.

3d.—That in a large mess it is not possible to have the variety procurable in a company mess, where properly supervised.

4th.—That there is danger, at times, of finding his food not as hot as he would like, owing to the great quantity handled and the time necessarily employed in serving it at a large mess.

These and a great many other reasons of similar nature, are forthcoming for the asking; although in this connection it should be noted that the poorer the company mess the more welcome the post mess, and the reverse. While perhaps admitting the excellence of the food provided for him at the general mess, he will nevertheless in all cases give his preference to the company mess system.

These objections are, in the main, good ones, for there are elements of fact in most of them.

After all, the question of the proper mode of messing is not one of how large a mess may be and yet be well managed; how well or how poorly the men may be fed; or whether or not the method employed is satisfactory as a factor of contentment. Neither should economy have undue influence, if shown to be misdirected. It is a question of higher importance than any such considerations;—it is one of education and efficiency.

The company is the unit of organization and should be com-

plete in itself, in all things and under all circumstances. The only way to secure this required efficiency for all emergencies of service, is to have but one system in all matters relating to its interior administration. Taking from the company commander while in garrison the right personally to manage and supervise the feeding of his men,—a duty which would fall upon him when his company is withdrawn from the consolidated mess on emergencies of any kind,—is the mistaken policy of the system before us.

This system has, during the past year or more, received careful investigation where it has been applied, by those deeply interested in the subject, and the opinion would seem a general one in favor of the company mess plan.

Progression and improvement are undoubtedly of importance, where properly directed, but the substitution of the post mess for the company mess at regular posts, is, to my mind, neither one nor the other, but is rather a backward step. It is impossible for me to find an advantage of sufficient importance to justify the substitution of the post mess for company messes at our regular garrisons.

Comment and Criticism.

(The remarks under this head have, generally, been invited by the Publication Committee, which desires that, as far as practicable, these "Comments" should appear under authors' names.)

I.

"The Management of a Post Hospital."

Lieut.-Col. W. H. Forwood, Dep. Surg. Gen., U. S. Army.

AN article by Major Hoff, Medical Department, U. S. A., on "The management of a post hospital" in the March number has been referred to me for remark. I have read the able paper of this distinguished young surgeon with great interest. The picture which he gives of the operations of a post hospital seems to have been taken from a military point of view. In this respect the subject has been comprehensively and exhaustively treated, and in matters of minor detail embodied in a long series of rules and regulations formulated to meet every possible or conceivable emergency or circumstance that might arise in the course of the routine management which certainly leaves nothing more to be desired. But there appear to be some very important features not included in the scene, yet essential to the *tout ensemble* of a modern hospital, which could not fail to interest physicians and surgeons who look upon such an institution as a place offering especial advantages for the exercise of medical and surgical skill, for the study of diseases and injuries, and for the practical training of young medical officers and nurses.

It is a question of live interest now at the military post hospitals as to the best plan of fitting up and managing a suitable and practical little laboratory adapted to the new conditions and requirements of modern medicine and surgery.

The arrangement of an operating room, the kind and quality of antiseptic instruments and dressings, the apparatus and methods for sterilizing, and the preparation and maintenance of things in readiness for operations and emergencies, with suggestions and recommendations might have been discussed with advantage.

The best system of forming and conducting a training school for the hospital corps men, the course of instruction and the manner of imparting it, to prepare them for the exercise of their functions as cooks, nurses and assistants in the operating room, would have been no less interesting.

The advantages of military discipline, the value of drills and inspections, and the necessity for formal and categorical rules of government must not of course be underestimated. But the tremendous stress that is laid by our author upon the awful importance of rank and *command*, the excessive exactitude in matters of mere form, the apparently needless restrictions of personal freedom among the patients, are painful even in the reading and they give to the administration of the hospital an air of melancholic military severity not in harmony with the purposes for which it is provided, and out of keeping with the scenes and incidents that are daily witnessed in the wards. In such an atmosphere as that, the impulses of sympathy, the words of cheerfulness and the smiles of encouragement which are naturally prompted in the presence of sickness and suffering, could only be regarded as undignified and forbidden levity inimical to discipline.

In the picture as thus presented there is no bright sunshine, no flowers on the bedside table of the fever stricken patient, no feeling of social and congenial warmth, no touch of human soul; we behold everywhere only the gloomy and threatening clouds of stern authority and command. Every patient must be in his place and at a signal from the senior high private all that are able spring to their feet, salute and stand to attention with the little finger on the seam of the trousers-leg while the medical officer commanding enters accompanied by his suite and passes down the ward on his official rounds.

Machine rule can never be made as strong as live power. It is just as easy to control a man when you have a hold on his heart as when you seize him by the scuff of the neck. There is too much military formality and too little real industry and useful medical and surgical work in this sort of hospital management.

In our civil hospitals, medical men of the widest reputation and the highest order of ability may be seen popping in and out of the wards from their workroom or laboratory to the bedside of their patients, studying particular cases and watching their progress; taking a drop of blood from the finger of one, a specimen of sputum from another, for examination under the microscope or for inoculation into mice and guinea pigs from which to prepare cultures in the test tubes and confirm the accuracy of diagnosis in certain obscure and difficult forms of disease. Microscopic sections are made from suspicious looking growths, and the cellular structure is studied to determine their nature or malignancy. Quite unostentatiously, unannounced and unattended, he busies himself about among the sick and wounded as their welfare or his scientific interest may direct, and there is no lack of respect, or order, or discipline, or sanitation, or efficient management and success in the treatment of patients.

But at a military post-hospital we are told, with reference to the senior medical officer commanding, that "his duties lie chiefly with the military personnel of the command." He is on the staff of the commanding officer of the post. He commands the medical department of the post. Much of his time and attention are taken up with frequent inspections and drills. The junior medical officer is to his senior "what a lieutenant is to his captain and he does what he is told to do." "The nurse is responsible for the care, cleanliness and nursing of the sick," and when a death occurs the senior non-commissioned officer of the hospital "reports it to the medical officer at once." A report of such an occurrence as this could only be made to the medical officer through the proper military channels even if it took an hour to find the senior non-commissioned officer present.

In this account of hospital administration we see nothing of the medical officer except in a military aspect and under belt and spurs. He marches to the drill ground, a major or lieutenant-colonel perhaps, and exercises a squad of hospital corps men in drawing and returning bread knives and slinging and unslinging blanket bags; he rushes over the parade with his litter bearers commanding "fours right," and "fours left"; he plunges through the barracks and grounds on his frequent tours of inspection, but we never find him in his laboratory in the peaceful pursuit of his studies. It would be a great relief to know that a post surgeon sometimes found opportunity and inclination to lay aside the irksome sword and devote a few spare moments to his medical duties. It would not compromise his dignity as senior medical officer commanding to put on his working clothes occasionally and let his eagle eye fall below an angle of 45° to look with gentle and kindly expression upon his subordinates and assistants. It might bring the warm blush of life and liberty back to faces blanched with fear and dejection perhaps, but there would be no sudden flood of mutiny on that account.

A deplorable weakness has made its appearance lately among a few otherwise most estimable members of our corps, taking the form of a sort of medico-military mania,

but I trust the impression has not gone abroad that these sporadic cases are at all serious or likely to spread. The vast majority of the medical corps of the army are bent upon maintaining and strengthening their old-time reputation for zeal and devotion to their own legitimate profession.

Major Philip F. Harvey, Surgeon, U. S. A.

Very little, except in the way of commendation, can be fairly said of Major Hoff's excellent compilation of rules for the management of a post-hospital, contained in the March number of this JOURNAL. They express concretely, and yet fully, the accumulated experience of many military surgeons under the varying conditions of service in the different parts of our country. This being conceded the comments which follow naturally apply mainly to the general subject of post-hospital management and but incidentally to the article, and are suggestive rather than conclusive.

The necessity for publishing a set of regulations to enforce a proper performance of duty and to maintain discipline, must become evident sooner or later to every medical officer who is charged with the diversified and responsible duties of a post-surgeon. It might perhaps be safely left to the experienced officer's judgment as to the number of points covered by and the extent of his regulative directions. Military brevity is a virtue not to be lost sight of, and prolixity adds nothing to cognition but detracts from force. The writer had the honor nearly a year ago to suggest, in an official communication to the Surgeon-General, the idea of promulgating a set of regulations for administration of army hospitals, with a view to assure uniformity of method and to promote efficiency, since which time the Surgeon-General of the Navy has published a set of hospital regulations for general use, the details of which I have had no opportunity to examine. The formulation of such a code as would be entirely suitable for general application throughout the army might offer some difficulties if the attempt should be made to go beyond mere outlines adapted to administrative guidance, and it might be argued that these are already well defined.

But undoubtedly a well digested set of rules assigning more specifically than is at present done, the several duties of non-commissioned officers and privates of hospital corps detachments, as suggested by Major Hoff, ought to be a benefit to the service. In regard to the rules that Major Hoff offers, it might be objected on the one hand that they are too voluminous to be used as a code for posting on the walls of a hospital, and on the other hand that they are too brief to serve as a text-book, as they fail to give all necessary points relating to duties and methods. But a sufficient answer would be that they could be used as a basis for either.

The very best result in military medicine, as in civil practice, is attained by the absolute prevention of disease, and all hospital regulations should have in view this, as well as the next best thing,—the speediest cure of those cases that occur in spite of our most approved efforts at prevention.

Great improvements in the details of hospital administration have taken place within the past few years. One of the crowning glories of human benevolence finds modern expression in sanitary and sumptuous hospitals and methods of giving relief to suffering and disease. This is the practical outcome to have in view as the motive to guide our efforts in hospital management. The corner stone of hospital efficiency is the medical knowledge and skill of its staff, and upon these the most successful management must be built, and certainly nothing more could be desired to give force and direction to the accomplishment of this than the admirably arranged course of instruction to newly appointed assistant surgeons recently inaugurated at Washington. But essentials to success of scarcely less moment are to be found in a cleanly condition of the various parts of the building and the orderly movements of a well trained and dis-

ciplined corps of attendants. Regarding this latter feature it might be remarked that under the operations of recent legislation, offering increased inducements for service in the Hospital Corps, an increase of the intelligence of stewards and privates will result. It seems that such a change for the better is already becoming manifest. With improvements in character will come, *pari passu*, greater ease of control. Compulsion is the rule of the service, but it cannot be denied that excessive exaction arouses antagonism to authority. Tennyson puts it that,

"He that only rules by terror
Doeth grievous wrong,
Deep as hell I count his error."

On the other hand, undue leniency weakens authority and engenders contempt for it.

In a word, firmness, moderation, a clear division of duties, a few sharp rules for interior discipline, police and government, and a consistent enforcement of the army regulations and the articles of war, would appear to epitomize a policy as well adapted to secure the desired results as any.

The paper in question looks in this direction, and if its precepts are heeded, results as good as possible can scarcely fail of attainment.

Major George W. Adair, Surgeon, U. S. Army.

Major Hoff's article on this subject is so complete and perfect that comments upon it are apt to have an unintended air of captious criticism. The value of these rules is much greater than might be concluded from the author's expression, " * * * compiled from well known sources and evolved from an experience common to every medical officer "; for, to find these sources, to gain this experience, the young medical officer will require more years than there are pages in the article ;—and his summary will very probably be inferior to that presented by Major Hoff.

The tour of duty for a nurse in the occupied ward is too long at the best, and there must be provision to get him away for a part of each twenty-four hours. My plan is to have a posted roster of every private in the department for " Evening Duty in the Ward " from supper until eleven o'clock. Without such relief no nurse can maintain his health and efficiency for even a month.

With this trifling addition I would let the article stand for what it is : a very perfect model for others to imitate—and improve upon if they can. I believe that it will contribute much toward that useful uniformity which the author desires ; but, should the paper convince the proper military authorities of the " advisability of a uniform method of administration," as seems to be the expressed desire of the last paragraph, I should deeply regret its baneful result.

Endless variation is the charm of chess and of medicine ; and the post surgeon must be the supreme authority to make, to modify, or to annul, the rules of his hospital. A central bureau of the War Department can never meet these ceaseless variations—can never practice medicine. It would be a bad object lesson in discipline to set at naught established regulations on the grounds that they were at variance with reason and common sense. Take, for example, from the author's rule 20, page 302, " Smoking is not permitted in the wards * * * "—a good rule. Who supposes that a soldier confined to his bed by a broken thigh, or from other cause, will be deprived of his tobacco,—subjected to punishment—because he is injured in the cause of his country ! The pneumonia patient in the next bed, gasping for breath, may be inconvenienced by the smoke ; if so, there is a defect in the ventilation of the ward that must be immediately corrected ; more injurious than the smoke is the impure air from the lungs of his neighbor which that pneumonia patient would have gone on inhaling indefinitely, had not that smoke rendered it visible.

These things must be considered from a medical as well as a military point of view.

The latter considers a patient as a unit to be subjected to a rule common to all similar units ; the former considers each case as a problem differing in some respect from all other problems and requiring medical skill for its solution. Where these views conflict, each medical officer should be permitted to draw the line for himself. This personal equation cannot well be corrected by general orders and circulars. I studied medicine long before my introduction to military affairs and will therefore jealously resent any encroachment upon my province as a physician. This bending of the twig may have resulted in a deformity of the tree ;—but it is a very stubborn deformity that cannot be corrected now. Your appliances may bruise the bark, sever many fibres, and otherwise impair the usefulness of the tree ; but you will never bring that tree up to your standard of beauty.

Take, for example, from rule 5, page 301, " Each patient will be given a bath upon entering the hospital unless his condition forbids it." Fortified by routine, custom, force of habit, this rule practically insures that every patient will receive a bath when he enters the hospital ;—for the patient's condition will rarely speak loud enough to reach the consciousness of the average enlisted man. If this rule meets Major Hoff's approval, I would not limit his right to maintain it ; neither would I limit his right to change his method whenever he deems it advisable. For myself, I prefer to feel that the patient receives his bath as he receives other treatment—not because he is admitted to hospital—but because he needs it and will be benefited by it. I prefer to have something to say concerning its necessity, its duration, its variety, its temperature, etc. My assistant admits patients at surgeon's call ; two days later, I do not wish to find them all bathed. Neither will I leave this matter to the judgment of my skilful assistant ; in epidemic influenza, eruptive fevers, acute rheumatism, pneumonia, cardiac disease, etc., I prefer to give my own directions, to superintend my own precautions.

Somewhere I have heard of a machine that receives the log at one end and from the other sends forth clothes-pins—every one alike. While I believe in that uniformity that will result from the careful study and imitation of the best methods, I shall not deem my time wasted if this paper contributes its mite toward saving the Medical Department of the United States army from such a machine.

Capt. Charles E. Woodruff, Asst. Surg., U. S. A.

Major Hoff's article in the March JOURNAL is composed in great part of rules that are so axiomatic as to need no explanation, and they are therefore beyond criticism. It is perhaps only in the matter of the duties and relations of the junior medical officer, the general relation of surgeon to patient and the necessity for the higher grades of nursing, that there is an apparent defect. As these topics exert a vast influence on the management of the hospital, they should be given the widest and most complete discussion.

The paper truly states that the junior medical officer is the lieutenant of the post surgeon "and does what he is directed to do." This announcement of his duty of obedience is supplemented by a short list of a few of the many things to be done about military posts, and which the junior may be called upon to do. It might have been stated that he is usually required to "assist" the post surgeon by doing any or all of the duties laid down as those of the senior medical officer. This has been the custom, with the result that while the junior at one post may do everything, at another he may do nothing ; here he may be held strictly responsible for certain duties, there he may be considered on hand merely for the purpose of sending him away as soon as occasion offers. Until he receive definite instruction as to his duties after his arrival at a post, the junior never knows whether he is to be "fish, flesh or fowl."

That this idea of the duties of a junior should produce vicious results might be predicted from the fact that it violates the principle for which Major Hoff has written his paper, "the advisability of a uniform method of administration." That it has produced vicious results is evident if there is any truth in the tradition that a certain medical officer at his second examination stated to the board that he had never been given an opportunity to do a single surgical operation. What would be thought of the condition of affairs in the line if a first lieutenant at his examination for his captaincy should remark that he had never been given an opportunity to command even a detachment of his company?

The professional duties of a medical student are so vastly different in character from those of the line officers that I doubt the advisability of comparing them, even to the extent of the somewhat far-fetched analogy above. After thousands of years of experience, these two sets of professional men have secured rules for their guidance in professional contact. The military have secured a code of ethics called military custom and etiquette, which is as different from the code of the medical men as winter is different from summer. The two codes are opposite because the purposes of the two professions are opposite, one to destroy life and the other to save it. Hence the grafting of the code of one profession upon the other is invariably disastrous. To treat the insubordinate, disobedient and perhaps vicious soldier with the gentleness of the sick room, is just as absurd as to use harsh repressive punishment on a patient in the delirium of fever or the agony of pain. Ordinarily, military discipline is a vicious adjunct in the treatment of the sick, it is the mother of brutality and it should be reserved for special occasions. When a man is malingering or is purposely increasing or prolonging illness or disability in order to escape duty or leave the service, it is high time to bring into play the restrictions of military discipline and compel him to recover or submit to the proper treatment. In war times these cases of course are quite numerous, but in peace they are so rare that there is but little necessity for harshness in the treatment of the sick.

No men are infallible, so all must be expected to make mistakes. Ordinarily the little mistakes of life are of but little moment, and many of them, even some big ones, can be rectified after the error is discovered, but who can rectify the error in judgment in some apparent trifle that has sent a soul to eternity? In every walk of life where irremediable disaster may follow one man's judgment, it is customary to devise plans whereby a man's mistakes cannot possibly do harm, for instance in the block system in railroads. Similarly in medical matters it should be managed so that errors of judgment be so few and harmless as possible. In the treatment of the sick it is often imperative to receive the full unrepressed advice of a *confrère*, even though he be our junior. This independence of thought is utterly impossible if the junior is always subordinate and always doing "whatever he may be directed to do." The free opinion of a junior to his commanding officer is a military heresy apt to be followed by a court-martial. Hence in the treatment of the sick, military etiquette should be sent to the dogs, where it belongs, and in one branch of his duties the junior medical officer should not be to the senior, "what a lieutenant is to his captain."

Nothing in the foregoing in the least militates against the most rigid adherence to military etiquette in all other things, for nothing is so absurd as a military officer who is not a *military* officer, but it does tend to repress a medical officer from attending a case of obstetrics clad in his boots, spurs and sword. It might be remarked in passing that adverse criticism of the medical officer being *military* in his *military duties*, besides being silly, has heretofore come from writers grossly ignorant of his true duties, and who believe that to change anything in an army is heresy. They are of the belief that he is solely to be occupied in prescribing pills and extract-

ing bullets. They are just one century behind the times. They are ignorant of the fact that the advances in all sciences, military science included, have added vastly to his sphere, and that he is expected to do much more than our grandfathers or great-grandfathers, who were honorable and efficient military surgeons. In all the military duties regarding the personnel of the hospital, the junior is in truth the lieutenant of the post surgeon, and as strictly amenable to military discipline as any one in the line.

The paper shows that the post hospital is merely a condensation of a large general hospital accommodating perhaps thousands of patients. In this hospital is found a system which it is surprising is not applied to post hospitals. "The forty wards fall to the care of twenty medical officers, each having charge of two wards." The medical officer in charge of a large general hospital cannot possibly attend the sick, and he need not, in the smaller ones, take this sole responsible duty away from his juniors. It is a mistake to suppose that because a man is responsible for certain things he must give them his personal attention, and therefore the senior should attend sick call and give medical assistance to the sick in wards. The higher a man's responsibilities, the more nearly impossible it becomes for him to render such personal attention, which must therefore become the responsible duties of the subordinates. In Major Hoff's plans, so excellent in other respects, every one in his department is given duties for which he is made individually responsible, with the sole exception of the junior medical officer. If the junior were by regulation given some definite and distinct duties, there would not be found such anomalies as a post surgeon accepting the advice of a steward instead of his junior commissioned officer, or ordering his juniors to report at the hospital at 9 A. M. and stand at attention until he made his visits to the ward, or of ordering his assistant to remain in the hospital from morning until night whether there was anything to do or not, or of calmly ignoring his existence altogether. Truly "a uniform method of administration" is quite advisable. Again, if the junior is merely to do whatever he may be directed to do, it is impossible for him to aid "in every way possible to maintain the efficiency of his department," because in the first place his efforts to aid may lead him to do the opposite of what he is told, and in the second place, he has no means of learning his senior's plans.

In the same way the command of the hospital corps in this military work would naturally fall to the juniors, just as in the large general hospital. A medical officer of the rank of lieutenant-colonel, with drawn sword in front of a large detachment of eight men, with a major and captain behind the file closers, would be a harrowing sight indeed, and quite apt to evoke shouts of laughter, yet it is possible for such a state of affairs to exist. A major of the line left at a post with a lieutenant and a few men, is apt to give the command of the men to the lieutenant or even to a corporal. Then why should not a high ranking medical officer in command of a big hospital, with its various subordinate commands under junior officers, do likewise when his command is restricted to that of a small post hospital? To have the lieutenant in command of the detachment would be less liable to evoke ridicule—and nothing destroys *esprit-de-corps*, the personal influence of the medical officers and their efficiency, so quickly and completely as ridicule. No one can blame the line officers when they laugh at seeing a major in full command of six men, with a captain and lieutenant among the file closers. Some arrangement such as making the junior the commanding officer of the hospital corps, is directly in the line of reserving to the senior assistant the executive duties he would have were the hospital suddenly increased in size.

The professional relations of the surgeon to his patients bring forcibly to the front a bad result of making them too official, and too military—I refer to the cases of venereal disease. No soldier wishes these unfortunate results of his own misconduct to be known, and he will keep them secret at the greatest cost and inconvenience. He

will never seek the advice of the surgeon, until the moment he cannot do his duty. He acts thus because of the publicity and because he knows there is no such thing as a professional secret in official medical service. Everything must be stated in reports. The natural result is that soldiers annually spend many thousands of dollars on worthless or worse than worthless quack medicines, and often fall into evil hands. Even death itself has been the unfortunate sequel of such practices, as I have personally witnessed in the case of a first sergeant who wished to keep his disease from the knowledge of his captain. If these cases must be kept secret, let the surgeon be the custodian of the secret as in the case of every civil practitioner. Though I have always encouraged soldiers to come privately for medical advice for ailments that do not necessitate relief from duty, and have willingly aided them, I have recently learned of another method far better. A medical officer of much intelligence and experience has for this purpose had a regular office hour during which soldiers may consult him privately. This custom may prevent these unfortunates from falling into the hands of quacks and blackmailers, may save much illness, and much loss of time to the service, and may even prevent death. The soldier can thus be made to understand that he can have a secret that his doctor can hold sacred. An office hour, in addition to sick call, is therefore an experiment in the management of the hospital well worth trying. The objection that it keeps from the company commander the knowledge of the character and condition of his men, is not of value, for these cases would not be brought to his knowledge anyhow, unless they became too ill for duty. The omission of the diagnosis from the company sick book was done for this very purpose of protecting the men, and as far as I can learn it has received unqualified praise from all company officers. The private office hour would also be a boon to men sick with other slight ailments, who would like advice but who are ashamed to go to all the fuss and red tape of the sick book and sick call, for such trivial complaints. For reasons similar to the above some surgeons advocate doing away with the official sick call altogether. This is such a radical idea that it is received with horror by men wedded to everything old in an army just because it is old. There is not much doubt of the advisability of the change, and it would not interfere in the least with the usual routine of the company. *Let every soldier come to the hospital when he is taken sick, just as many do at present.* Some soldiers have an idea that if they are taken sick they must wait all night long until sick call is sounded. They even have their names placed on the book the night before and remain in their quarters twelve or fifteen hours waiting for sick call—a sad commentary on official medical attendance.

If there is to be a sick call, the hour at which it is sounded, though considered foreign to the subject of the paper as it is exclusively in the hands of the post commander, really does exert a greater influence in the management of the hospital. There seems to be a delusion that it must take place before guard mount, and some think the earlier the better. The routing of sick men out, at such an unreasonable hour as 6 A. M. has been called cruel, and so it does seem to be. Surgeons rarely ask to have the call made late, perhaps because of a feeling that they would be considered to have selfish motives. As most men are taken sick in the daytime, or at least are supposed to be, the only logical time for sick call is immediately after retreat. Men taken in hospital then, will have a quiet night under appropriate remedies, and it is quite likely that many an illness might be cut short or made milder. Such an hour would be more inconvenient to the majority of surgeons than a reasonable morning hour, but it would, in evident ways, conduce to a better management of the hospital. It would also be a great advantage to first sergeants and company commanders, whose plans are so often upset in the busy morning hours, by men detailed for guard or other duty, suddenly remembering that they are sick. Men should be returned to duty at

any hour it is discovered they are well enough, and not be compelled to wait until the morning sick call.

The present system for the management of the hospital had its origin before the period known as the aseptic era of surgery. Consequently we see but little effort made to secure the aseptic conditions which are the sole idea in the surgical side of modern hospitals. It is right here that there should be some decided departure from the old methods. There are some surgical operations that are perfectly safe if sepsis is certain; but we would hesitate before resorting to them in the ordinary conditions of an army hospital, unless it was a case of absolute necessity. In the first place there is no operating room in the majority of army hospitals, though this is not a vital defect because the most serious operations are daily performed in amphitheatres that are notoriously bad, and yet good results are quite the rule if other conditions are attended to. These other conditions are the most particular and perfect cleanliness of the person and everything coming in contact with the patient. It is usually necessary to call on the privates as assistants in serious cases, particularly if the surgeon is alone and has but one steward who must give the anæsthetic. Ordinarily each private has considerable police duty to do, and it is the next thing to impossible for him to keep himself in that cleanly condition necessary. It is particularly bad if he must attend to several stoves, clean the utensils of the sick room and be a general scavenger. I have yet to see an attendant in charge of a ward who can keep his hands in fit condition to handle surgical instruments and dressings. In civil hospitals the matter is easily arranged, for all these duties fall to orderlies or student nurses who have nothing to do with the nursing, the dressing of wounds or the surgical operations. The nurse of the ward should never be required to do any police duties that will soil his clothing or render him unfit for the higher duties. He should wear a clean white jacket and a clean white apron to cover his trousers, and his hands should be faultless as to cleanliness. He should confine himself exclusively to the duties known as nursing, and all police duties should be done under his direction by some one else. If the ward is large enough, two privates are required in the ward and the matter is solved, but in the tiny wards of most hospitals the attendants would be out of place, and here comes in the difficulty. In such a case an acting steward or an intelligent private who is excused from all police duty beyond simply dusting and arranging the dispensary, should be given charge of the dressings of all surgical cases, and be particularly instructed in all points as to personal and other cleanliness so as to be a safe assistant in operations. As a hospital enlarges and the number of attendants increase, the above difficulties disappear.

In the British army, nursing is said to be given over exclusively into the hands of female trained nurses even in the field, and the results are said to be excellent. Starting with the magnificent work of Florence Nightingale in the Crimea, there has been a long series of noble women who have followed the army in foreign wars, and who have been decorated and honorably mentioned in orders for bravery and devotion to duty in places of great danger. Ordinarily men are not as good nurses as women, and the results of placing women in sole charge of the nursing of the sick in hospitals is so good that it is followed in all civil hospitals, though I am strongly of the opinion that to place them in sole charge of men's wards is a grave error. Nevertheless it has been confidently stated that in the management of our post hospitals, the surgeon will be vastly assisted by having a trained female nurse in charge of as much of the nursing as possible. Such a system is impossible with us, situated as we are at present. We are forty years behind our British friends, and at the present outlook there seems to be no possibility of a change.

Nevertheless men may possibly be made as good nurses as women by means of

constant instruction. The senior medical officer should see to it that he trains his own nurses. This is a most important part in the management of the post hospitals, and I am sorry that Major Hoff in his scheme has not embodied more rules in this direction. During the season of the year devoted to school work in the line, there should be at least five lectures or recitations each week on nursing, first aid and invalid cooking, and during the rest of the year at least two a week. After privates have shown particular merit or have passed proper examinations, say after two years, they may be excused from further instructions, and given the higher duties of the hospital. Privates unable to comprehend the matter by reason of stupidity, lack of education or adverse temperament, should be kept at the more menial duties, which are really the only ones for which they are competent. On discharge the more competent privates should be given certificates equivalent to diplomas from a training school for nurses. This may enable him to secure high grade profitable employment in civil hospitals, as I understand a few ex-members of the hospital corps have already done. Much of the instruction here outlined could be given by stewards, acting stewards and passed nurses, but the more important lectures should be given by the junior medical officers and by the post surgeon himself. To my mind the training of the attendants is one of the important and essential parts of the management of a post hospital, just as in civil hospitals, for without it the service rendered is miserable, and the management consequently poor. There is neither sufficient time nor practical work in nursing for this instruction in the schools for the hospital corps. Unfortunately the men of the hospital corps of sufficient intelligence and education to become excellent nurses, do not enlist for that purpose. They enlist to become stewards, so the ambition to become a thorough nurse is limited to the inferior men. This is one of the reasons why the English army has secured good nurses among women whose sole ambition is to be high class nurses.

II.

"The Corps of Engineers."

Brevet Colonel William M. Wherry, Major 6th U. S. Infantry.

GENERAL ABBOT in his Historical Sketch of the Corps of Engineers, published in the JOURNAL for March, 1894, makes an effort to correct "the general misapprehension as to the old 63d Article of War, now expunged from the list," in order to prove that "the organic acts raising the engineer troops now in service," in "the provision that these organizations shall be entitled to the same provisions, allowances and benefits in every respect, as are allowed to other troops constituting the present military establishment, * * has settled the old standing controversy as to right of command in actual service with troops." And cites an endorsement made by General Sheridan when commanding the army, July 7, 1885, as follows:—"When engineers are on duty with organized bodies of troops of their own corps, they are or should be considered as line officers, and when a command of engineer troops happens to join or do duty with the troops of other corps, the engineer officers should be entitled to command, or to be commanded, according to seniority of rank."

Now with all deference to General Abbot's legal acumen I venture to assert that the provision of law he cites does not settle the controverted question; does not give engineers the right to command over line-officers; does not make engineers line officers, even when serving with engineer troops.

General Abbot has permitted his zeal for his corps and his desire to prove a claim, which is untenable, to cloud his judgment and lead him to a construction of law, and regulations, and precedents, at variance with lawful decisions.

It would be hard to find a more curious misinterpretation of a statute than that of

General Abbot in saying (page 426) "Foreseeing the trouble which might arise (*i. e.*, in regard to right of command when different corps of the army are serving together), Congress wisely enacted," etc., etc.

The section quoted (1155 of the Revised Statutes) declares what number of non-commissioned officers, musicians and privates shall constitute a company of engineer soldiers, and that these shall be recruited in the same manner and with the same limitation, and shall be entitled to the same provisions, etc., as are allowed to other troops constituting the present military peace establishment. The whole section explicitly deals with recruited men and these alone.

It is true that exigencies might arise in which it would be absolutely necessary that engineer troops should be required to fight and act as soldiers, defensively and more seldom offensive-defensively, but that does not make them of the line, nor of the body militant. They are essentially a part of a staff corps. Being designated as "The Corps of Engineers" does not make them a part of the line of the army. They are specifically designated "The Corps of Engineers" in contradistinction to a corps of the line.

Section 1157 relates to the services upon which they may be employed, which are all of a non-combatant character.

When we turn from the recruited "engineer soldiers" to the Engineers, *i. e.*, the commissioned officers, Section 1158 is equally explicit, and declares that "Engineers shall not assume nor be ordered on any duty beyond the line of their immediate profession, except by the special order of the President." This so clearly confines Engineers to their "immediate profession" in every assumption of duty or assignment to it, as to leave no room for dispute.

Each section has its own subject matter so plainly limited that it only needs attentive reading to see that the subject of general command, when different corps are together, can only be reached by Engineers of the army through Section 1158, which forbids the assumption of or the assignment to such command.

Section 1158, which takes the place of "the old 63d Article of War, now expunged from the list" (which *is* indeed the old 63d Article of War itself, divested of unnecessary verbiage and placed in the statutes in conjunction with the other sections relating to the Corps of Engineers), recognizes the true functions and limitations of authority and military right to command of Engineer officers, and, as much as that article ever did, deprives them "of the right of succession in command by virtue of seniority of commission, when different corps of the army joined to do duty." That right is provided for by statute in the 122d Article of War, and is confined by its terms to "the line of the Army, Marine Corps and Militia." Devolution in command by reason of absence, disability or manifest impediment on the part of the senior or commanding officer of an organized force, is another thing, and is not provided for by any written law, or regulation, but is governed by the unwritten law alone,—the customs of war, the usages of the service.

General Sheridan's endorsement of July 7, 1885, does not prove anything, unless it be that very distinguished officer's opinion of what "should be,"—when engineer officers should be considered as line officers and when they "should be entitled to command or to be commanded, according to seniority of rank."

That opinion and endorsement, in any sense in which it may be taken, is at variance with practice and is diametrically opposed to the decision of the War Department made a few years ago only, when a captain of Engineers commanding the engineer company at West Point undertook, in the absence of his seniors in rank, to take command of the post and troops serving there, over his junior in the line of the army. Then the War Department decided that he could not do so, but the line officer should, must, take command.

We are willing to concede the valuable and meritorious services rendered by the Engineer Battalion in peace and war and on fields of battle, but the fact that the battalion is allowed to inscribe upon its colors the names of many battles extending over a period from the Mexican War to the present; "that it was attached to the Headquarters of the Army" of the Potomac "under orders of the chief engineer, and besides its special duties was often placed in line of battle," does not make it in contemplation of law, a part of the line of the army. It has often happened in wars that in defending an imperilled point or place, "the sick, the halt, the lame and the blind," and non-combatant followers of all sorts, have been armed and placed in line of battle, but no one ever claimed for such as did not belong to an organization of the line beforehand, that their presence there constituted them a part of the line of the army.

We bear willing testimony to the distinguished and oft-times inestimable services rendered on the battle-field and elsewhere of the officers belonging to this corps in whose keeping is the "most elevated branch of military science," but outside their special functions as provided for by law, these services have ever been rendered under special assignment by the President in accordance with the provisions of Section 1158 Revised Statutes, or under commissions in the volunteers, and not as engineer officers pure and simple.

Under such circumstances alone may they take command of line troops by virtue of seniority of rank. Even the superintendent of the Military Academy at West Point, if an engineer so assigned by the President, does not command as a captain, major or lieutenant-colonel of Engineers, but under an enactment by Congress, which gives him while so serving the local rank of a colonel of the army.

In contemplation of law the engineers are on the same footing as to command outside their own battalion, as are officers of the other staff corps or departments,—the Ordnance, Quartermaster's, Commissary's, Signal Corps, Medical, Pay, and Chaplain's.

The Army Regulations, paragraph 16, reads as follows:—"Officers of Engineers or Ordnance, or of the Adjutant-General's, Inspector-General's, Judge Advocate-General's, Quartermaster's, and Subsistence Departments, though eligible to command according to their rank, shall not assume the command of troops unless put on duty under orders which specially so direct, by authority of the President."

It is remarkable how hungry all seem to become for command. What an itching the various staff departments have to get that sort of control of the line. Not content with the purely scientific branches of which they are the exponents and custodians, they want to command somebody else and now we no longer hear, from a certain number of surgeons of their being "in charge of a hospital." They are "in command"; and as they command detachments of the "Hospital corps," why are they not, in addition to their scientific functions, a part of the line of the army, and entitled to succession in command by virtue of seniority of rank? I for one am willing and glad to address such of the medical officers as desire it, and are tenacious of military titles, by the titles of their rank, rather than as doctor or surgeon, but I believe in their sticking to their professional functions. And as to the Engineers, while admitting the dignity and superior scientific attributes of their calling, I am constrained to hold they should be content with the honor and advantages they enjoy and not endeavor to encroach upon the prerogatives of their less fortunate brethren in the service,—the line.

The fact that Engineer troops have "the honor of the right of the line" on parades or other ceremonies, is only a concession to their superior scientific attainments and has no significance with reference to the right of their officers to command the line.

III.

"The Quartermaster's Department."

Capt. Edgar S. Dudley, Q. M. Dept., U. S. A.

I HAVE read with interest Col. Lee's articles on the Quartermaster's Department. His writings on any subject are always interesting, and they are particularly so when referring to matters of his own department, concerning which he is well qualified to speak from long and active experience, and evident study of its methods with a view of discovering any defects therein and, if possible, the remedies therefor.

I do not doubt that the great majority of officers will agree with him in his views, both as to administration and also as to the present methods of conducting business and as to the "forms" of the Quartermaster's Department; but the more important question is, how to make the desired changes and remedy the faults, rather than to state that there are faults and that remedies are necessary. Col. Lee suggests a method by the assembling of a board of officers for the purpose of considering the subject.

Some few matters might, possibly, be remedied by direct instructions from the Quartermaster-General, but the system as now in vogue would require more extensive reconstruction than lies within the power of a single department.

The Quartermaster-General has had long experience in the present system of administration and the business methods of his department and is aware of any defects therein, and of the great number of papers attending transactions of all kinds, many of which, in a business man's life, would be considered as an unnecessary accumulation of waste paper; so that there is no doubt but that the remedies would be applied if it lay with the Quartermaster-General himself to apply them. It seems apparent, therefore, that the power of remedy does not lie with him alone, but that there must be joint action with other departments.

The fact is that the tendency to centralization of business in the departments at Washington has progressed beyond a healthy limit for the good of the army. Originating in the purpose of remedying evils arising under the former system governing the use of authority and the disbursement of funds under apportionment to the different military departments and posts, it has been of gradual development until control has been assumed over even minute details, tending to take away responsibility which, in the interests of discipline, good management and proper and economical business methods, should remain with those in authority at the locality where the question arises, the duties are to be performed, or the expenditures are to be made.

The effect is often bad, not only in the delay of business and as a matter of economy to the Government, but also upon the officers concerned, in that it takes from them all sense of personal responsibility and causes them to defer to higher authority even in minor matters which ought to have their immediate action. It fails to develop that sense of responsibility, and the discipline needed for independent action in time of war, which ought to be felt by all commanders. It also tends to develop a feeling on the part of subordinates of uncertainty, that the decision of immediate commanders, even in simple things, may not be final, but may be changed by higher authority, which affects both discipline and administration.

Of the evil effects, in a business way, of the delays now encountered, there could be given many instances similar to that mentioned by Col. Lee, where the result has been detrimental to the best interests of the service. The present system of obtaining supplies, by purchase, etc., is most cumbersome and, with other matters, ought to be remedied and simplified. But the difficulty in so doing lies, I think, more with others than with the Quartermaster's Department, especially in so far as it relates to questions

of accountability. We will need a revision and remission of some of the requirements of the Treasury Department and of the decisions of the 2d Comptroller on many matters before we can get relief, even if we do not have to secure the authority of Congress by special enactment.

It is true that there is a possibility that some relief might be secured by mutual agreement between the Quartermaster's and other Departments, by establishing certain rules for the government of all parties in similar cases, but such unity of action is not likely to be had without considerable effort to secure it.

A competent board of officers, of whom Col. Lee should be one, might perhaps devise some system of relief in the way of simpler methods of administration and of fixed responsibilities, providing, also, for a reduction in the number and character of papers now required, which, if approved by the highest authorities, would be desirable and practicable; or even suggest legislation that might be clearly beneficial, be acceptable to departments and, if necessary, be enacted by Congress; it is to be hoped that something of this kind may be accomplished.

In all military matters the sense of responsibility should be cultivated and especially instilled and engrafted into the life of young officers; a due sense thereof is the best safeguard in the transaction of all affairs, both of the army and of the Government; things are likely to go loosely without it that would be well done if left with a sense of responsibility attached to their proper performance.

The time of the Executive officers at the War Department should not be taken up with details; they have more than enough of more important work, and there is danger in it, in that important matters may be overwhelmed with the numerous minor ones. Department commanders and chief quartermasters should be responsible for affairs within their departments in all particulars where such responsibility can be placed upon them.

Some things, such as the preparation of plans, the construction of public buildings, etc., are better supervised from the Quartermaster-General's office, in order that there may be secured the best plans and system of construction, with uniformity, so far as locality and climate will admit. Such supervision has thus far resulted in giving posts far better buildings than post quartermasters could secure under the old system of post plans, estimates, etc.; and in all similar things of like importance where uniformity of work, or other like benefit, will be derived from it, the method of direct supervision from the War Department may be best.

All reforms come only through the necessity thereof making itself apparent to those most interested therein, and through the efforts of those who are willing to devote themselves to explaining the need thereof and the proper remedy therefor. Col. Lee believes in the necessity of some reform and speaks what he believes from a full heart.

Whether the remedial measures are taken soon or late they will come some time; it is only a question of time and effort, for the practical American business man, citizen or soldier, will not long permit measures to continue in use which involve him in unnecessary work and delay the administration of his affairs. If nothing else does it the next war will cut the Gordian knot and restore transactions to necessary simplicity.

IV.

"Is the Three Battalion Organization the Best One for Us?"

Capt. Arthur L. Wagner, 6th U. S. Infantry.

MY comments, in the January number of the JOURNAL, upon Captain Edmunds' paper which appeared some months ago under the above title, were placed (through an oversight in type-writing) under the caption "Is the Three Battalion Organization Necessary for Us?" Captain Edmunds, in the last number of the JOURNAL, takes exception to this, accuses me of "selecting a new text," declares that the substitution of a new heading places the matter in an entirely different light, and conveys the information that "best" and "necessary" are not synonymous. I have no desire to discuss a question of synonyms, nor do I conceive that such a discussion is at all required. I regard the three-battalion organization as both *necessary* and *best* for us, and while perfectly willing to change the caption of my last remarks to coincide with that of Captain Edmunds' original paper, I see no occasion for making the least change in my statements or arguments.

Captain Edmunds seems to think that his arguments have not been carefully considered "by any or all of the authors of the articles written as criticisms of the original." A perusal of the comments made by five different officers, of various grades and arms of the service, on the paper in question will, I think, show that his arguments have been carefully considered. If those arguments have been uniformly misunderstood, it is both remarkable and unfortunate.

Captain Edmunds grants, it seems, that the three-battalion organization is necessary for the full development of the effect of modern rifles, the supply of ammunition, the handling, control, and discipline of the troops on and off the field, and fire discipline, but declares that it is impracticable, because "we have not the men, and cannot get the men." Now, if the three-battalion organization is necessary for the full development of the essential military qualities enumerated above, we must adopt it when opposed to troops possessing it, or be sadly, if not fatally, handicapped in the question of relative efficiency. If all nations with whom we are likely to come into warlike collision were to agree to mark time in tactical progress, and retain the same obsolete organization with which we are cursed, the expediency of adopting the three-battalion organization might be debated. As it is, I do not think the tactical experiences and experiments of military nations can safely be ignored, though they seem to think differently in Persia and China.

But, according to Captain Edmunds, it is merely a question of men. Now, in point of fact, on the outbreak of war we shall at first find a deficiency in arms, clothing, and equipments for the enormous armies that we can raise; and we shall find at once an abundance of nothing but *men*. "The organization adopted," says Captain Edmunds, "should be fitted for volunteers, as the regulars cut no figure in a war of any magnitude." Very true: and these volunteers could be raised from an aggregate of nearly nine millions of men available for military duty.

To the majority of volunteers, any drill system will be entirely novel, even if we carry them back to the ancient manœuvres of Upton or Casey. We may better give them a proper system to begin with, than to waste time in trifling with an obsolete organization and an antiquated drill. They *must* learn to shoot, and they *must* learn to fight according to the tactical requirements of the modern battle-field, if they are to accomplish anything in war. But Captain Edmunds says that the present principles of tactics "require at least two years of diligent practice, in the field at that, to perfect officers, and especially non-commissioned officers and men." If this were really the case, we should surely be in hard luck if we undertook to go to war. But, for-

unately, in the recent Chilian civil war, Major Körner, a German officer practically in command of the Congressional army, demonstrated that even raw levies, composed largely of ignorant men, can be taught the principles of modern tactics in a very short time. He showed that a German can teach a Chilian army in a few weeks principles which (we are asked to believe) can be mastered by Americans only by "two years of diligent practice, in the field at that." If this assertion of Captain Edmunds be correct, it would be interesting to be told whether it is because our officers are inferior to the German major and his Chilian subordinates, or because our soldiers are not equal in intelligence to the Spanish-American recruits. It surely does not take two years—nor one—nor six months—of *diligent* practice to make a regiment proficient in the close order drill; and I know personally scores of officers who would gladly guarantee to take a regiment which had mastered the close order drill, and render it proficient in the extended order movements in less than a month. The question of target practice will be found more difficult of solution with our raw levies than the question of extended order drill.

Captain Edmunds' experience at a one-company post may be regarded as so exceptional in these days of large garrisons as to make it of little value as an argument against the adoption of the three-battalion organization. There is now scarcely a garrison in which company and battalion drill cannot be provided by a consolidation of organizations, if in no other way. If our officers show in peace a tithe of the patriotism and zeal which they are expected to display so abundantly in war, they can find means, at nearly every post, for applying every feature of drill required by the three-battalion organization. As to the officer who, "having been for a considerable time on Indian duty, had never drilled troops in the new regulations," it is perhaps sufficient to say that no system of drill or organization can be devised that will enable an absent officer to have practical experience in handling troops.

In the last number of the *JOURNAL*, Captain Edmunds disclaims any intention of underrating the proficiency of American troops in the Revolutionary War or any other war in which they have been engaged. His statement (in the *JOURNAL* for November) is as follows: "It is a noteworthy fact in this connection, that during the whole war of the Revolution the American troops but twice used the bayonet to any extent, viz., at Stony Point and Eutaw Springs. Plainly shock action was not their forte and they could not be expected to so engage the highly disciplined and seasoned British troops." I thought this was intended to show that the American troops were not equal to the high test of shock action; but I must have misunderstood the writer's meaning. The statement that during the whole war of the Revolution the American troops but twice used the bayonet to any extent, was, we are told, made advisedly, notwithstanding the gallant bayonet charges at Camden, the Cowpens, and Yorktown. It now seems that Captain Edmunds means that these were the only battles in which the result *was* decided by the use of the bayonet. This is, as the Captain would say, quite "an apple of another tree," and certainly furnishes no ground for the statement that shock action was not the forte of the American troops. If the use of the bayonet was not decisive at the Cowpens, it is hard to find a case in which it was. In the face of the bayonets of the charging Continentals, the British threw down their arms, and fell on their faces, crying for quarter. The result could not have been more decisive, if each individual red-coat had been actually transfixed with a Yankee bayonet.

I cannot find in any reliable or generally accepted account of the battle of the Cowpens any justification for the glorification which Captain Edmunds gives the militia for their conduct in that famous action. The militia behaved there surprisingly well,

because they did not run as soon as they were expected to. Morgan besought them to stand until they had fired two good rounds at "killing distance." They actually fired *four* rounds—some authorities say "many" rounds—before they fled, and all accounts agree that they did considerable execution with their fire; but they ran all the same, and left the battle to be decided by Howard's Continentals. Captain Edmunds says: "The opinion is expressed by some persons who took part in it, that the battle of the Cowpens was won by the first line, militia and marksmen deployed as skirmishers in front of it." Possibly this opinion was held by some people—there are equally unfounded opinions held on many subjects by perverse humanity—but there were at least two persons who took some part in the action who evidently thought differently. In his book on "Campaigns in North America," Tarleton says: "The militia after a short contest were dislodged, and the British approached the Continentals." He does not honor the militia with any further mention. Morgan having been criticised for taking up a position in which his flanks were unprotected and his back was to a river, vindicated his judgment as follows: "Had I crossed the river, one-half of the militia would have abandoned me. Had a swamp been in view, they would have made for it. As to covering my wings, I knew the foe I had to deal with, and that there would be nothing but downright fighting. As to a retreat, I wished to cut off all hope of one. Should Tarleton surround me with his cavalry, it would keep my troops from breaking away." Such were the comments on the militia by the two commanders in the noted fight in question.

In his mention of the battle of Eutaw Springs, Captain Edmunds, while extolling the conduct of the militia, fails to note that the troops with whose bayonets Williams "swept the field" were Continentals. The militia here fought with unwonted courage, actually firing *seventeen* rounds before they stampeded, leaving the Continentals to finish the fight as best they might. Troops must be measured by a low standard when such action is regarded as particularly creditable; but the action really did show great improvement in the militia. At Camden they had thrown down their loaded muskets and fled without firing a shot; at Guilford Court house, they had done but little better; but they were now actually able to stand long enough to fire seventeen rounds. It is evident that they were becoming war-seasoned, and that they no longer depended merely upon the "enthusiasm, patriotism and valor," which had been unable to carry them through on former occasions. To extol the virtues of the militia in the Revolution is to fly in the face of facts. Probably no person was ever so well fitted by experience and ripe judgment to criticise these troops as Washington; and he expressed himself in regard to them as follows: "Regular troops alone are equal to the exigencies of modern war, as well for defense as offense; and whenever a substitute is attempted, it must prove illusory and ruinous. No militia will ever acquire the habits necessary to resist a regular force. The firmness requisite for the real business of fighting is only obtained by a constant course of discipline and service. I have never yet been witness to a single instance that can justify a different opinion." Again he said: "Experience, which is the best criterion to work by, so fully, clearly, and decisively reprobates the practice of trusting to militia, that no man who regards order, regularity, and economy, or his own honor, character, or peace of mind, will risk them upon this issue." On another occasion he declared: "Short enlistments and a mistaken dependence upon militia have been the origin of all our misfortunes."

We have never yet suffered a military disgrace that was not due to the employment of undisciplined soldiers; and when we begin to inculcate a reliance on raw troops, and aim to shape our organization mainly with a view to preparing hasty levies for immediate service; when we rely upon a national reputation as marksmen which is based upon conditions that no longer exist; and when we blindly trust to enthusiasm, patriot-

ism, and valor to take the place of discipline and military training, we are deliberately ignoring the lessons of our own past, and preparing the way for disaster.

Captain Edmunds infers from the continual failure of Congress to pass any bill providing for the three-battalion organization for the infantry, that "the reorganization of this arm on the lines proposed is not for the best interests of the service or the nation." This inference would be justifiable if Congress were composed of military experts; but as matters really are, it is the army rather than Congress, that is responsible for the failure. Whenever a bill providing for the organization in question is introduced, members of Congress are deluged with letters from officers of all arms, inspired by self-interest, jealousy, and many other motives, including in some instances, a real solicitude for the best interests of the service. It is no wonder that Congress, perplexed and disgusted with the diverse views and selfish motives displayed, drops the matter for its own peace of soul; though the bill invariably comes up again at a succeeding session, because its intrinsic merits will not allow it to be killed.

The three-battalion organization, in the different forms proposed, has had the unique experience of being enthusiastically advocated and bitterly opposed by officers actuated solely by the question of promotion; and Captain Edmunds, perhaps unconsciously, appeals to this class when he gives warning that the organization in question cannot be obtained without a reduction in the number of regiments. If we cannot have an efficient organization without being limited to a smaller number of regiments, then let us cheerfully accept the reduction, no matter who is hurt by it. It can be said to day as truly as it was said by Washington, "The object ought to be to have a good army rather than a large one." The country maintains us not because of any innate right on our part to become colonels, but because we are supposed to be of value to the commonwealth. If selfish aims are to regulate everything, if efficiency is to be sacrificed to the sole object of individual advancement, if an organization essential to military proficiency is to be rejected because its adoption will defer somebody's promotion, or because the drill suited to it requires industrious effort, how long will our army be worth maintaining? The nation might better be without an army than rely on one which is sure to fail it in the emergency of war; for in the former case, it would at least have some appreciation of its complete military nakedness. We should be willing to make any reasonable sacrifice to obtain an organization in which we could take a professional pride. Far better be a lieutenant in a truly efficient force than a general in the army of the Grand Duchess of Gerolstein.

[NOTE.—In regard to the militia in the Revolution, my opinion is based mainly on the works of Irving, Fiske, Sparks, and Lossing. The British works of Stedman and Tarleton also give valuable testimony on the subject.]

Reprints and Translations.*

MUSKETRY EXPERIMENTAL FIRING.

(From The United Service Gazette.)

FACILITIES exist in India which, unfortunately, we do not to the same extent possess at home for carrying out experiments in connection with musketry, and considerable interest, therefore, attaches to those which are frequently made in our great Eastern dependency, and we propose here to touch upon a few which were conducted during the season 1892-93, as recorded in the last annual Report of Musketry Instruction in India.

A practical and useful exercise took place at Changla Gali in June last. With the view of preventing the supposed enemy's working parties effecting during the night repairs to a damaged intrenched position, a party was pushed up at dusk to a point 380 yards distant from the enemy, and logs of trees and forked sticks were improvised as rests, to enable fire to be kept up during the night, which was a perfectly dark one, two machine-guns also being placed in position and laid on the objective before dark. Fire was first opened by volleys from the rests. A pit had been dug about 300 yards in advance, and on the flank of the enemy's position, and from this bombs were thrown out by markers to represent the enemy opening fire. The position of this pit and the distance were unknown to the firing party.

The results were that a party of officers and Native ranks volley firing from rests of logs and forked sticks obtained a percentage of 16.66 of hits on a target 103 feet by 45 feet, laid flat at a range of 850 yards, using 800 yards elevation. The remark is made that the shots in many cases went high, sufficient pains not being taken by the officers in preparing rests, the notches cut in the logs allowing too much play. The forked sticks, which we should have thought likely to prove the less reliable, are pronounced to have proved satisfactory. A section using rifles prepared with luminous tape judged distance on the bombs, adjusted sights and opened fire first by volleys, then independently on the flashes. The percentage of hits on a target 43 feet by 36 feet, laid flat, proved to be 14.21, the distance being 600 yards and the elevation 500 yards. The tape used for this experiment was, it seems, old, and it not being possible to procure new paint in India, as it appears to us it certainly should be, the patent sight invented by Mr. E. A. Down was not used. The two machine guns, a Gardner and a Nordenfelt, made a percentage of 11.40 hits on a target 39 feet by 55 feet, laid flat, the distance being 800 and the elevation 700 yards. The several percentages

* Please address communications concerning reprints, translations and reviews to Lieut. J. C. Bush, editor of this department.

are undoubtedly small, and we think give ample proof, if proof were wanting, of the importance of practising night firing. It is explained, however, that the distances were considerable, and none but direct hits could be obtained on horizontal screens. Both the machine guns too, being a good deal worn with drills, worked off the objective at night when it was not possible to correct the laying.

Several additional points were brought out by other experiments also conducted at Changla Gali. In one intended to illustrate the notes in "Mayne's Fire Tactics" on the subject of using two elevations for sights where distance has to be estimated, the advantage of under-estimating ranges, especially at night, was shown. In another, where a party at night was provided with ordinary white tape tied over the foresights, the arrangement appeared to answer very satisfactorily. The many advantages of the small bullet are, it would appear, seriously discounted at extreme distances by the very great difficulty of seeing where it falls. With strong glasses even, it was found that scarcely anything could be seen of the fall of the bullets of forty three rifles at 2000 yards in the ranging volleys. As supplementary to one experiment, "judging distance" by sound was carried out. Judging was on the flash and explosion both of bombs and of blank cartridge. The greatest difficulty, we are not surprised to find, was experienced by every one in judging at the shorter distances; the longer the distance, the more correct were the answers.

At Deolali experiments were made in connection with night firing and with machine guns. On a dark night, when the objective could not be seen, what we think must be considered very fair results were attained (115 hits out of 465 rounds fired) with rapid volleys of Martini-Henry and Lee-Metford rifles, the direction of the enemy's advance having been roughly marked on the ground during daylight by pieces of white paper and handkerchiefs. The object of the machine gun practice carried out with two 3-barrel Nordenfelts was to test the rapid fire of such guns defending a bridge, the guns being in position behind slight earthworks, but the detachments fallen out. On the "alert" sounding the guns were manned and rapid fire opened. The fire was stopped about every 30 seconds for an average of 8 seconds to allow the smoke to clear away and objectives to be changed. The total duration of rapid fire was 5 minutes 35 seconds, and of pauses 1 minute 28 seconds, making together 7 minutes 3 seconds. There were no jams, and the result of the firing was fifty-five hits out of 675 rounds fired. Major H. D. Rosseter, Chief Instructor, reports that Watkin's mekometer, obtained privately from Messrs. J. H. Steward, opticians, London, was carefully tested on measured ranges, and found to be easy to learn, rapid in working, and very accurate. Far too often, we consider, is it necessary to jog the authorities on by aid of private enterprise.

Special interest attaches to the practice, believed to be unique, conducted in Aden Harbor by command of Brigadier-General John Jopp, and under his personal observation. The object was to ascertain what practice quick-firing guns, Gardner guns, and infantry could make at night at targets anchored in the harbor and illuminated in succession by the electric search light of the *Redbreast*. The "general idea" was that a torpedo boat was

endeavoring to enter the inner harbor to destroy shipping. The following guns and troops were brought into action :—Nos. I. and II. 6 pounder quick-firing guns on Fort Morbut, two 3-pounder quick-firing guns on a moored barge, and eighty rifles of the 2d Battalion South Wales Borderers with two Gardner guns on two other moored barges. The general officer commanding, who was himself on board the *Redbreast*, testifies to the excellence of the firing, considering that the men were new to the work, and the rolling of the barges was against very accurate firing by 3-pounder quick-firing and Gardner guns. By the strike of the former, careful laying is acknowledged to be evident, as the shot fell mostly so close that a boat would have been struck below the water-line, though some few were a little over. The practice of the two 6-pounder quick-firing guns from Fort Morbut is stated to have been excellent.

Fairly accurate aim was found possible at a well-illuminated target at night with naked sights both by guns and rifles. To illuminate the sights of the quick-firing guns bull's-eye lanterns were used. The bead foresight of the "speed sight" of the 6 pounders was found far better for night work than the acorn sight of the 3-pounders, and the tangent sight of the "speed sight" easier to lay with than the notch pattern. With a brightly illuminated objective, the gun can be laid without any lantern; but it is pointed out that a light is necessary to enable the tangent sight to be set correctly, and it also facilitates the laying. In view of the fact that all of the lanterns both on shore and on the barge were extinguished at some period of the proceedings referred to, it certainly would seem necessary that some other form of lantern should be provided. We would recommend to the authorities as a matter worthy of consideration whether small electric lanterns with storage batteries might not be usefully adopted.

In the course of his report upon the experimental firing at a range of over 2000 yards with Lee-Metford rifles and black powder cartridges carried out at Umballa, Captain C. L. Woollcombe, D. A. A. G. for Musketry, observes that two years ago he conducted some similar experiments at a range of 1650 yards with the Martini-Henry rifle on the same ground, and it is interesting to compare the penetration of the bullets into the ground of the two rifles. Captain Woollcombe picked up the Martini-Henry bullets lying on the sand and on the screen, which they had not even penetrated; but with the Lee-Metford there was not a bullet to be seen, and those that had gone through the canvas sheet were found five or six inches deep in the sand.

Night firing experimental operations carried out at Meerut tended to prove that the light obtained from the star-shells in their descent showed up the objective better than that emitted during their combustion on the ground. The former was also observed to light up the muzzles of the firing party's rifles to an extent that facilitated aim. This, as Captain H. H. Dobbie, D. A. A. G. for Musketry, observes, is an important consideration in favor of the light from descending stars, and such as would appear to render it preferable to other light. The superiority of "Down's Patent Night Sight" over luminous tape is vouched for by Captain E. H. F. Finch, Adjutant of the North-Western Railway (of India) Volunteer Rifle Corps, who superin-

tended trials to determine this point. Down's sight showed up particularly well after a few rounds had heated the barrel.

In the same course of experiments a simple and efficacious method was devised whereby at night elevation may be kept under control and within effective limits. This was effected by laying rifles with back sights raised to 350 yards on two parallel rows of planking supported edgewise on the ground by tent-pegs, and by then so adjusting the height of the planks that the lines of sight were directed on the ground line of objects at that distance. By simply placing the rifles on these planks at night, and thus keeping the flight of bullets within six feet of the ground, men entering the zone of fire from a distance of about 500 yards are, as Captain Dobbie points out, brought within the effective power of the rifle right up to the muzzle.

A GENERAL REVIEW OF EXISTING ARTILLERY.

A LECTURE PREPARED FOR THE INTERNATIONAL CONGRESS OF ENGINEERS AT CHICAGO.

BY GASTON MOCH, CAPTAIN OF ARTILLERY.

Translated at the Military Information Division, War Department, A. G. O., Washington.

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THE SPHERICAL DENSITY.

NEVERTHELESS there exists one very simple means of valuing the relative length, fictitious or not, of a projectile, whatever may be its calibre, its real length, and its mean specific weight. This is to return to the notion of weight expressed in spherical balls, a relation that, in order to abridge matters, I propose to call the spherical density.

When the employment of oblong projectiles commenced, this term of comparison was used for a long time; then it was given up perhaps because the consideration of a spherical ball appeared somewhat out of date. This contempt was unjust, for the spherical ball constitutes exactly the most practical common measure between projectiles differing in their calibre and their nature. The comparison of two projectiles of different calibres, in relation to their transverse densities, is not sufficiently close, for their transverse densities depend upon their calibres, and it is necessary to go back to a common calibre in order to create an idea of the relation which exists between them. For example, a shell of 9 cm., weighing 8 kg., weighs 126 gr. per sq. cm., its transverse density is then greater than that of a shell of 6.5 cm., which would weigh 4 kg., or 121 gr. per sq. cm. And yet the first projectile is relatively less heavy, or, if you prefer, not so long as the second; it has only the weight of three spherical balls, while the second has the weight of four.* Its excess of transverse density depends only upon its greater calibre.

*It is evidently necessary to agree upon a specific uniform weight for the material from which the spherical ball under consideration is made. For greater convenience I will suppose that this ball is made of a theoretical casting having a specific weight equal to 7. This specific weight adopted in the old Aide-Memoire (edition of 1861) is "That which we should obtain by operating upon a mass of cast iron equal to that of the ball, on account of the interior spaces growing out of the "shrinkage in casting."

Now, it cannot be said that it is relatively more heavy; if it were only as heavy, that is to say, if this projectile were similar to that of 6.5 cm., it would weigh 10 kg. 700, and its transverse density would be 168.

It is evident that if we go back to the custom of valuing projectiles in terms of spherical balls, then these intermediate reasonings will disappear. To go back to the preceding example, if we compare two projectiles, one of 9 cm. and the other of 6.5 cm., we shall not learn much about their ballistic value by saying that they have respectively 126 and 121 as their transverse density. The consideration of this coefficient alone would give a superiority to the first; in reality, it is very possible that the second would act better in air, but in order to be certain of that it will be necessary to laboriously calculate their trajectories. If, on the contrary, we characterize them by the fact that their spherical densities are 3 and 4, we shall have a very satisfactory preliminary idea of the ballistic value and initial velocity which belongs to each of them.

Once again, to say that one projectile weighs more than another by a square millimetre of section teaches us nothing about the subject of their relative weights if they are of different calibres. And if the first has a calibre very much greater than the second, it could very well be relatively lighter, or shorter, if we prefer. Let us, for example, push the reasoning to the extreme. Let us suppose that we have been given the two transverse densities mentioned above, and that we are considering a shell of 42 cm., and a bullet of 8 mil.; the first at 126 gr. per sq. cm., will weigh 174 kg., or one-fifth of the weight of the shell mod. 83, and will then be very bad from a ballistic point of view; the second, with 121 gr. per sq. cm., will weigh 61 gr., or four times more than the bullet mod. 86; this will be only too good, for it is from a gun that could not resist its own fire. We should have immediately perceived these qualities if it had been stated that the spherical density of the shell (or its relative length, allowance being made for the influence of the ogive) was equal to 0.64 and that of the bullet to 32.5.

One more example under this head. If the increase in the initial velocity has as an obligatory consequence an increase of the transverse density, this property would be amply verified by comparison with small-arm bullets whose calibre has not ceased to decrease and the velocity to increase, to a considerable extent.

Now this is not the case; the transverse density has remained sensibly constant, while the spherical density has undergone variations parallel with those of the velocity. The transverse density was equal to 26.3 for French bullets mod. 66 and mod. 74, also for the German mod. 71. But it is known that at this time a whole series of considerations outside the ballistic value of the arm have influenced the determination of the calibre and the projectile. This value was a little weak.

In spite of new reductions of calibre, the transverse density has not departed perceptibly from the value 30, it is equal to 29.8 for the French rifle mod. 86, and to 31.4 for the Austrian gun mod. 88, which are 8 mil. (calibre); it is only 30.9 in the Swiss piece mod. 89, of 7.5 mil., and it goes up to 31.5 in the Italian gun mod. 91, of 6.5 mil. On the other hand, the spherical densities are, respectively, 8 for the French small arm, 8.4 for the Aus-

trian, 8.9 for the Swiss, and 10.4 for the Italian. Now do not the spherical densities of 8.4 and of 10.4 give a better account of the relative ballistic value of the two guns, with calibres of 8 mil., and of 6.5 mil., than the transverse densities of 31.4 and 31.5. Will any one go so far as to maintain that the Swiss gun is inferior to the Austrian because its bullet weighs less per square millimetre?

28. The implicit influence of the calibre comes in then to transform the transverse density into a veritable mirage (*trompe l'oeil*).

The spherical density is, on the contrary, preserved from this fault. Sensibly uniform in any given system of artillery, we see it grow in proportion to the progress realized by the initial velocity to such an extent that it is not possible to reduce anything from the variations of the transverse density. While the first oblong shells weighed less than twice the weight of the spherical ball, they have attained to-day a density of 4 and are even beginning to pass that considerably.

I will return to these considerations in connection with the projectiles for use in the field whose organization is in other respects more complicated than that of armor-piercing shells. It is sufficient here to have shown that spherical density is a useful thing to consider from the point of view of actual fire of projectiles.

We are now going to discover that it constitutes a very convenient element in the working out of interior pressures, and as a consequence in the establishment of the curve (of pressures); this point is most interesting for the constructor, since it touches upon the possibility even of making a cannon capable of the desired effect.

In this way the consideration of the spherical density leads us to the question of the improvement of the efficiency from which we seem to be a long way off.

THE APPLICATION OF THE PRINCIPLE OF SIMILARITY.

29. I do not think that it is possible to imagine a more simple method of establishing the advance design of a cannon than that which has been indicated by M. Sarrau.*

Having given the calibre c and the weight of the projectile p , the variables left free to produce a ballistic effect, that is to say, to realize an initial velocity V without passing a maximum pressure P are, the length of the path of the projectile in the gun u , the weight of the charge ω , density of loading d ; the duration of the combustion of the grain τ ; finally the form of the grain.

This stated, M. Sarrau has calculated for a projectile of a determined type, and for powder of fixed form of grain, a series of tables giving as functions of the different values of P of u and of ω :—

First. The greatest initial velocity that can be realized.

Second. The density of loading (whence is obtained the volume of the

*Note (autographic) upon a table of initial velocities. Believing this capital memoir to be as well known as it merits I had not judged it necessary to reproduce the substance of it in my notes upon the field gun of the future. From this some obscurity followed, in the minds of certain readers, in regard to the subject of considerations relative to spherical density; that is why I now return to it.

chamber) and the duration of the corresponding combustion. These tables have been drawn up for a calibre of 1 decimetre* and for a projectile weighing 11 kilograms, that is to say, three times the weight of the spherical ball. This permits us to solve the problem relative to any other calibre and any other spherical density by applying the two following theorems:

I. For the values given of P , u , ω , and of the variable values of ρ ;

The velocity V varies in inverse ratio to the square root of ρ ;

The density of loading Δ is independent of ρ ;

The duration of the combustion τ varies directly with the square root of ρ .

II. (Principle of similarity.) The values of the velocity and that of the maximum pressure are the same in two similar guns, similarly loaded, that is to say when the weight of the projectile and of the charge vary as the cube of the calibre. The linear dimensions and the duration of combustion vary as the calibre. The density of loading remains the same. As an example of the application of these tables I present two problems which are considered numerically in the note of M. Sarrau:

First problem.—To determine the conditions of loading which, in a certain calibre c , impress a velocity V upon a projectile weighing three times the weight of a round shot. A maximum pressure is imposed, and there is to be sought in the table corresponding to this pressure the velocity required; there is found here a system of values of ω , u , and Δ , and τ for powder of given composition, the value of τ permits the determination of the thickness ε of the grain. All these results answer to the calibre of 10 centimetres, and to the shell of 11 kilograms; thence we pass to the wished-for calibre with the same spherical density by applying the principle of similarity, that is to say, by modifying u and ε proportionally to the calibre, ρ and ω proportionally to its cube. The volume of the chamber is equal to the weight of the charge divided by the density of loading.

It is to be understood that it may happen that the pressure chosen *a priori* does not permit the desired velocity to be realized. This fact will be immediately perceived, the velocity in question not appearing in the table corresponding to this pressure. In this case, we take the lowest of the pressures in the table containing the velocity and proceed as above.

Second problem.—To determine the conditions of loading which, in a cannon of a certain calibre c , will impress upon a projectile weighing ρ Kg. a velocity of V metres.

The pressure limit is placed at P .

The operations to be performed in order to use the table are the following:

First. To reduce the weight of the projectile to the unity of calibre by dividing ρ by c^3 , which gives a weight of ρ^1 .

Second. To modify the velocity V in accordance with the theorem I, by multiplying by the square root of the weight of the projectile in order to obtain the corresponding tabulated velocity.

$$V^1 = V \left(\frac{\rho}{11} \right)^{\frac{1}{2}}$$

*That is to say for the calibre unity, it is known that all the formulas of M. Sarrau suppose that the kilogram and decimetre are taken as units.

Third. To seek in the table of velocities corresponding to the pressure P the velocity V^1 or the nearest approaching velocity. It is found that this velocity is realized by a system of values, u^1 , ω^1 , Δ , and τ^1 .

Fourth. To modify u^1 proportionally to the calibre, whence $u = cu^1$; ω , proportionally to the cube of the calibre, whence $\omega = c^3\omega^1$; τ^1 proportionally to the square root of the ratio of the weights of the projectiles and to the calibre, whence $\tau = \tau^1 \left(\frac{\phi}{11} \right)^{\frac{1}{2}} c$. The volume of the chamber and the

thickness of the grain are calculated as in the preceding case. This method permits us then to determine with the greatest ease and in a few moments the ballistic elements of any cannon whatever. As on the other hand it depends on the principle of similarity—that is to say, upon the consideration of pieces which, among other peculiarities, fire projectiles of the same spherical density—it amply justifies the importance which I believe proper to attach to the definition of projectiles in terms of their spherical density.

MAXIMUM PRESSURE AND MEAN PRESSURE.

30. The tables whose use has just been indicated rest upon this principle, demonstrated by the same author. Among the systems of values of Δ and of τ , which give the same maximum pressure (ω remaining constant), there exists one for which the velocity is a maximum. As on the other hand these tables are calculated for different values of ω , they permit us to fix the conditions of loading which will give the greatest useful effect compatible with the resistance of the gun, which is measured by the maximum pressure that can be imposed upon it.

There exists one other means, purely empirical but very rapid, for obtaining approximately the maximum pressure which corresponds to a given living force, and consequently to a given efficiency. It rests upon the intermediate consideration of the mean pressure. This is also called the constant pressure which could be communicated to the projectile during its passage through the bore, a velocity equal to that which this projectile really possesses upon leaving the gun.

If, besides the notions previously laid down, we call ω the right section of the bore, the definition of this imaginary pressure P is translated by the relation

$$P = \frac{\phi V^2}{2g \omega u}$$

Now, it is easy to prove that for a given powder and with the same length of bore the ratio of the maximum pressure to this mean pressure is determined at least sufficiently to be able to serve as a basis for an approximate calculation.

We have then, calling, in order to make work shorter, E the initial

energy of the projectile, $P = \alpha P_1 = \alpha \frac{E}{\omega u}$; α being what I shall call a "*co-efficient of reduction*," and which depends upon the kind of powder employed. And if, finally, we call C the weight of the gun and R its efficiency,

we shall have, $R = \frac{E P \omega u}{C \alpha C}$.

31. These considerations are important from the point of view of the improvement of the efficiency. As we have seen, this improvement depends either upon an increase, or a better utilization of the pressure, or upon greater perfection in the construction of the gun, all of which come out of the formulas given above.

For the increase of the pressure this is evident. To better utilize the pressure brings us back to diminishing the coefficient α —that is to say, to preventing the curves of pressures from falling too rapidly, or, indeed, to increase the distance traversed in the gun, u —that is to say, to prolong the action of the gases. Finally to bring the construction of the gun to a greater perfection comes back, all things being equal, to diminishing its weight, C .

It should be remarked also that the increase of u before mentioned implies necessarily that the construction be perfected in the same direction. If it is wished to increase the efficiency, all things being equal, it is, in fact, necessary that we gain back in thickness of the gun the weight expended in elongating it. So, then, as a final analysis, three factors upon which we may act to increase the efficiency are P , α , and C .

THE ADVANCE TO BE EXPECTED IN POWDERS.

32. The coefficient of reduction α is the first I shall take up, because it is that from which least is to be expected, and as a consequence least merits being dwelt upon. In a former work I wrote what follows *:

Perfecting the powder is what has just been accomplished, and I am permitted to believe, without running the risk of being treated as a mere man of routine, that we are not upon the verge of seeing realized a second step of the same importance. The error of many people is in thinking that new powders spring up suddenly, by a kind of spontaneous generation; nothing in that case would prevent our reaching a second similar phenomenon. The truth is that during the years that nitrogenized explosives of great power have been known there has been no cessation in the search for the means of adapting them to the fire of cannon. It was after long methodical search that, at the end of the year 1884, a general method, which permitted us to control their manner of combustion and adapted it to an arm of determined calibre, was discovered at the Central Laboratory of Powder and Saltpetre.

This substitution has resulted in placing at the service of artillery the most powerful explosives that we know to-day. From this it follows that the adaptation to the fire of cannon of any other explosive actually known can bring to ordnance only an improvement of detail, and that a new step in advance comparable to that which has been recently made cannot be taken, except by the discovery of explosives of a type entirely different from those which chemistry to-day places at our disposition.†

Thus what we are now concerned with is the complete utilization of the most powerful known explosives. We shall doubtless find better some day, but how far in the future?

* "Notes upon the Field Gun of the Future," 36.

† "Memorial on Powders and Saltpetres," V. III, pp. 11 and 12.

Now it becomes necessary to note the fact that for the old black powders the coefficient of reduction was in the neighborhood of 3 (it was equal to 2.9 with the powder C_1 , employed in the French field cannon). For the Nobel powder, the best known among the new powders which are not kept secret, its value is about 1.6, and may descend to 1.5. It was then proper to add that an advance of one or two tenths would be something very considerable.

The ideal towards which powder-makers are approaching would be, in fact, to make an explosive in which this ratio would be equal to 1—that is to say, in which the curve of pressure would be a horizontal right line. But like every ideal, this is impossible to reach; it is forbidden even in pneumatic guns. Of necessity the pressure must always go on growing up to the moment when the projectile begins to move, and even if it should remain constant, from this very instant the ratio given would remain greater than 1. It is, then, not rash to say that on approaching this limit progress will be more and more slow, as always happens in such cases; whence it results that, however recent may be the nitrogenized explosives, they are not to be expected to give much more than they have thus far done.

33. It has been objected to this reasoning that I have not taken account of passive resistances and different losses, in consideration of which it would be proper to increase the mean pressure from 10 to 15 per cent.; that I have thus admitted too small a value for this mean pressure, but that, on the contrary, I have exaggerated the values that the coefficient α now possesses which would have about compensated for the defect in reasoning.

In this there is a confusion that is very easy to obviate. The mean pressure is not a force really applied to the cannon, and as a consequence measurable like the maximum pressure; it is a simple theoretical expression, useful to consider, and which we have the right to define, as I have above, by the well-known relation.

$$P_1 = \frac{p V^2}{2g \omega u}$$

If it is thought important to consider the passive resistances we will consider another ideal pressure defined by a relation of the form

$$P_2 = A + \frac{p V^2}{2g \omega u}$$

which goes back to

$$P_2 = B P_1$$

A and B being two numerical coefficients.

This definition would be quite as legitimate as the other if we had not already spoken of mean pressure; but from the moment that this word became currently used in another sense it became proper to designate this pressure by a new term under the penalty of falling into misapprehension.

The mean pressure has interest only on account of its relation to the maximum pressure and as a means of obtaining an approximate value for this last, and thus of rapidly determining whether a cannon can produce a certain given living force. For this purpose it is to be remarked that we have $P = \alpha P_1$; if, instead of the pressure P , we consider the pressure P_2 equal, as has been seen, to $B P_1$, this pressure will be connected with the maximum

pressure not by the coefficient of reduction α defined above, but by another coefficient, β , such that $P = \beta P_s$ and that consequently $\beta = \frac{\alpha}{B}$.

It is thus not astonishing that if we make the passive resistance enter into the computation we find a smaller value for the coefficient of reduction. This comes back exactly to the same thing; the whole matter consists in coming to an understanding in regard to the definition of the mean pressure. With that which I have adopted, long since admitted, we may say that for the Nobel powder, the coefficient of reduction is in the neighborhood of 1.6, and that it would be very difficult to gain again one or two-tenths upon this value, even by employing a very different explosive. With the other definition the value of the coefficient β descends about to 1.4; that is to say, still nearer its limit, which, in both cases, is unity. The relative benefit to be hoped for from it is then still less.

34. To sum up, the coefficient α is actually about equal to 1.6, and cannot fall below unity; that is to say, it cannot be diminished by more than 37 per cent. of its value. On the other hand, the efficiency of the cannon is inversely proportional to this coefficient. We arrive, then, at the following conclusion:

The improvement in existing explosives will allow with difficulty an increase in the efficiency of cannon of more than one- or two-tenths of its value; admitting that a theoretic powder is realized, that is to say, a powder giving uniform pressure throughout the whole path of the projectile (in the gun) (which may be conceived in the case of a pneumatic cannon), the limit of the improvement in efficiency that can be realized is 37 per cent. of its actual value.

RATIONAL UTILIZATION OF POWDERS OF HIGH PRESSURE.

35. The increase of the maximum pressure imposed upon the cannon, and upon its reinforce, or what comes to the same thing, the easing of the last to equal pressure, are questions equally connected with each other. Firing under very great maximum pressure is not precisely the object which powder-makers and constructors have thus far sought; indeed, on the contrary, for about a quarter of a century since we have abandoned the old "cannon powder" for products methodically obtained in view of a given effect, we have held fast to the endeavor to restrain this pressure within limits far below those which it might reach; that is to say, to the pressure in a closed *éprouvette*. We were, in fact, forced to be prudent on account of the weakness of existing cannon. With bronze cannon the maximum pressure might go as high as 1800 atmospheres;* with those of hooped steel, it reached generally, in ordinary service, 2500 atmospheres; it was, indeed, then, very necessary to restrain within these limits the force of the powder.

But this proceeding brings to mind, as has been remarked, the action of a horseman who, possessing a too-spirited thoroughbred, brings him under subjection by starvation before mounting. Instead of cutting down the

*It is understood that the word atmosphere is taken as an abbreviation for kilograms per square centimetre.

oats, he would do better to improve his own riding. In the same way it is evident that if instead of restraining the expansion of our powders, we succeed in strengthening our cannon in order to make them fire under higher pressure, we should find a great advantage. At least the benefit would be considerable for pieces like those of the navy, which ought to develop a maximum of living force, and which actually tend toward the attainment of lengths called unreasonable by those who have charge of mounting them on board-ship.

36. That which distinguishes new powders from the old in the actual conditions of their employment, is that they are more progressive; that is to say, that the curve of their pressures in the bore falls more slowly, but at the same time they have much more force; that is to say, in a closed *éprouvette* they develop a much higher pressure. To employ them at the same maximum pressure as the old is, then, to waste a still more considerable portion of their power; and, more than the others, they seem to urge us to reinforce our guns, in order to draw forth a better proportion of that which they can give us.

We have only the embarrassment of choice between the different means of increasing the maximum pressure. We can, for this purpose, increase the weight of the projectile or that of the charge, reduce the capacity of the chamber or modify the compositions or the dimensions of the grains of powder.

All these methods have considerable influence upon the result, in the sense that in the first place a small variation of any one whatever of these elements is sufficient to increase the pressure often more than could be wished. But, however, they act differently at the moment when the maximum is produced, and for the same reasons, upon the manner in which the pressure then decreases.

It follows from this that their choice is not at all a matter of indifference; two processes which furnish the same maximum pressure may give very different initial energies.

37. These matters are very little known, for it is the fashion in all countries to keep secret work that relates to interior ballistics, a science which, nevertheless, does not need this secrecy in order to become singularly difficult. I do not know, in fact, of any work regularly published upon this subject except that of Mr. Longridge, entitled "The Artillery of the Future and the New Powders." I shall not discuss the premises which the author himself gives as arbitrary, but which have at least the merit of leading to empiric laws that sufficiently agree with experience. His conclusions, all in favor of high-pressure fire, merit the greatest attention.

I will only note here that in the course of this work the author studies the relative value of the different operations which permit the maximum pressure to increase. For this purpose he considers a cannon which fires a projectile of given weight under a pressure of 2800 atmospheres; then he supposes that this pressure is doubled by modifying either the length of the chamber, the weight of the charge, or the dimensions of the grains, and he calculates in each one of these cases the living force obtained. He thus reaches this important conclusion that the maximum ballistic effect is

obtained if we preserve the chamber of large capacity and if we increase simultaneously the weight of the charge and the dimensions of the grains ; in this way is obtained a living force passing by 35 per cent. that of the cannon in which double the pressure has been obtained by shortening the chamber without modifying the charge or the grains, that is to say, by increasing simply the density of loading.

This interpretation is exactly that which was everywhere reached before the adoption of the new powders, large chambers, strong charges, and large grains. All would then take place, according to Mr. Longridge, as before, with a difference in regard to the form of the powder, which is greater ; this was, however, to be expected, the formulas of the author being calculated upon those of M. Sarrau, and differing from them only in the coefficients.

38. To sum up, it is easy with the new powders to increase at will the maximum pressure, and to dispose it at the same time in such a manner that the curve of pressures does not fall too rapidly in spite of the height of the maximum. These powders then permit us to obtain more considerable living forces by means of cannon relatively short, provided these cannon are sufficiently strong. We shall be able then to increase the efficiency of the cannon, if the metal thus gained from the length of the chase is preserved to reinforce the thickness of the wall.

IMPROVEMENT IN CANNON METAL.

39. It remains for us to inquire how the efficiency may be increased by acting upon the cannon itself—that is to say, how the cannon may be put in a condition to support pressures superior to those which it is now the custom to give them.

To do this two means are at our disposal—to improve the quality of the metal employed or to otherwise improve the system of cannon construction.

They are seeking constantly and everywhere to improve the metal for cannon ; and to this end may be employed, again, two different methods—according as we act chemically upon the composition of the metal itself, or mechanically by modifying the treatment to which the ingots are submitted.

Chemical improvements have their origin in the surprising results obtained by the Holtzer shell against chrome steel and the Creusot plates of nickel steel ; these results naturally allow us to entertain great hopes of the cannon made with the aid of these metals. Unfortunately the different establishments which are searching in these directions have the greatest interest in keeping silent in regard to their methods of manufacture, and in regard to the composition of their alloys.

As to the quality of the products obtained thus far, precise ideas are also lacking. At least the only experiments that I am prepared to cite are those made at the Krupp works in October last. They took place with two field guns of 8.7 cm., one constructed of the ordinary Krupp steel, the other of nickel steel.

In each one was exploded a shell of 8.7 cm., containing 170 gr. of picric acid and placed 300 mm. from the muzzle. The gun of crucible steel was

broken; its front part, having a length of 170 mm., was carried away, and the 255 mm. back of the part blown away were reduced to numerous fragments. The gun of nickel steel showed only an enlargement of 7.4 mm. at the seat of the projectile, but no crack. In this same gun they then exploded, at 300 mm. from the bottom of the bore, a projectile loaded with 180 gr. of picric acid; it produced a swelling of 9.5 mm. and a longitudinal crack 80 mm. in length without a fragment of metal being broken off.

40. These results are very remarkable and make a very favorable augury for the solution of the problem which is still only at its starting point. Nevertheless they must not be exaggerated. In the first instance, they were content to say in Germany that cannon of nickel steel were proof against the accidental explosion of a shell in the bore; this statement seemed very greatly exaggerated in France, where was formed a very different idea of the use and of the constitution of explosive shells. I will again return to this detail; it is sufficient to say here that it is not known with us that it is merely a question of a very modest charge of 170 or 180 grams of picric acid. To take in fact the figure given by Capt. Schubert, our elongated shells of '90—that is to say, of the same calibre as the Krupp cannon—contain 1400 grams of explosive, about eight times more, and according to the most ample investigation it does not seem probable that a metal can be made capable of resisting it.

To sum up, all that can be said is that we shall probably see before long cannon constructed of chrome steel or of nickel steel and that these cannon will have, to an extent difficult to foresee, a greater power of resistance than those of ordinary steel, but it seems illusory to wish to make them superior to the test of a premature explosion of a torpedo shell.

41. As to mechanical improvements, the most interesting by far that has been thought of in latter times is that of M. Mannesmann. We know that it consists in causing a heated ingot to pass through a roller of particular form; the material is there twisted upon itself, worked up in such a way that the ingot entering the roller solid leaves it in the form of a hollow cylinder. The structure which this curious method of fabrication gives to the metal is fibrous and in the form of a helix; the cavities which may exist in the mass are filled in or rendered harmless, since they themselves become thread shaped and helicoidal. We can conceive, then, that the cylinders thus obtained give proof of specially high resistance.

42. It does not seem to me, however, that this process has yet been able to give, amongst its conditions of marked superiority, tubes as large and as thick as those used in the construction of cannon. The only numerical results of which I can speak in regard to this are the following, obtained from the Royal Laboratory of Magdebourg:

A tube 24.6 millimetres in calibre, having a thickness of 1.95 millimetres, has stood without apparent deformation an interior pressure of 800 atmospheres; its interior butt end was then submitted to a tension of 59.8 kilograms per square millimetre and the limit of elasticity was not yet reached. Sixty kilograms at least of elasticity certainly give an excellent figure. But what is it for a cylinder of 2 millimetres thickness? The more reason to ask, as we have already measured much greater limits given either by small

ingots of special steel or in wires. I have cited elsewhere a sample of the last which gave, as early as 1887, limit of elasticity, 161 kilograms; elastic elongation, 0.575 per cent; breaking weight, 223 kilograms; elongation to rupture, 1.1 per cent.*

A more interesting thing is the series of experiments executed at Charlottenbourg upon Mannesmann tubes of 15 centimetres calibre, 25 millimetres thickness, and two and three metres in length. According to the report it was a question of testing the traction of bars cut from these tubes. The six specimens tried gave as a mean: Limit of elasticity, 36.4 kilograms, (extreme values, 31.2 and 44 kilograms); breaking weight, 84.8 kilograms, (extreme values, 77.9 and 92.9); elongation per 100, 14.6 (extreme values, 11.4 and 17.4.)

These numbers do not encroach to a remarkable degree upon those obtained readily from ordinary processes, the more so as the thickness of the tubes was rather small. As early as 1883 the first appendix of the "Aide-Memoire for the use of the officers of the French artillery," summed up in effect as follows the qualities of hardened cannon steel: Limits of elasticity, from 27 to 42 kilograms; rupturing weight, from 54 to 75 kilograms.

It may be that the Mannesmann steel presents important accessory advantages—for example, in relation to rapidity and cheapness of fabrication. It is, besides, very probable that this manufacture will go on improving, and will permit giving to large cylinders all the qualities which now distinguish the small, obtained by this process. But as well as can be judged from the results which come from one of its strongest partisans, it does not seem to me that this method can, up to the present, have made decided progress in the construction of cannon.

WIRE WINDING.

43. If we now pass to the system of wire construction, properly so called, we may state that there is at the present time more to be done in this direction. There was long ago laid down, without sufficient importance being attached to the fact, a certain means of powerfully reinforcing artillery. I mean to say a substitution for the ordinary hooping—hooping by steel wire.

It is a rather curious thing to notice that the Mannesmann process leads in two different ways to the consideration of this mode of construction.

In the first place, one of the principal factors in the superiority of the Mannesmann tubes consists in the texture which the rollers give to their material.

It is stated, as I have already said, that the metal is rolled into fibres having the form of helices, as if the mass were formed of a bobbin of threads welded together; and when they shall have succeeded in giving this intimate structure to large tubes, the latter will constitute the best possible elements for the construction of cannon.

On the other hand, it has been seen that this process permits very readily the formation of thin tubes of surprising resistance. Now we know all the

* "Cannon of steel wire," §87.

advantage there is to be found in reducing to a minimum the thickness of the hoops, since the useful work given by the metal decreases rapidly from the centre to the circumference. The employment of Mannesmann steel seems to have led thus quite naturally to that of hoops or jackets thinner than those actually in use. Now, the limit of this thinning of the hoops is their replacement by wires. It is precisely this consideration which has originated the idea of the winding with steel wire.

44. I have elsewhere shown in detail the long continued inception of this remarkable invention. As early as 1850 Mr. Woodbridge produced in the United States an iron gun wound with iron wire, but he had not taken any account of the laws of tension, and, besides, the idea which he always held of soldering the wires together destroyed the whole principle of the invention. His gun was a sort of variation of the Fraser or Ribbon system. In 1855 Mr. Longridge produced in England the first wire-wound gun (*cannon à fils*), properly so called. Since then he has continued constantly to improve upon the manufacture, of which he gave the mathematical theory in 1884.*

To him should be given the whole honor of the invention, and if it sees the light of day it will be thanks to the passionate tenacity with which he has unceasingly defended it for nearly forty years. It would be unjust not to mention in connection with him Capt. Schultz, who was led by the study of the hooping of cannon to the same conclusions, and who in 1871 to 1881 caused two different types of wire-wound guns to be tried in France.

To-day the advantage of wire winding is universally recognized in what concerns the resisting of the cannon to bursting. These can be summed up thus: The entire thickness of the hooping is utilized under the same conditions of work; the materials employed are of superior quality, proved in the very operation of wire drawing (*tréfilage*). With equal weights the cannon is then much more powerful; besides this, the winding of the threads under tension is done automatically, so that we are perfectly assured of obtaining the desired tension; the operation, easier than hooping, is thus much more rapid; the saving is perceptible.

45. It may be asked how it happens that for the last few years all cannon have not been constructed according to this system. It is because there still exists on this subject an inexplicable feeling of prejudice. It is currently heard said that wire wound guns lack longitudinal resistance; in the month of January last this assertion could be read in a great English review, to which Mr. Longridge has not failed to protest, as usual.

*"A Treatise on the Application of Wire to the Construction of Ordnance." London and New York: Spon, 1884. I explained in a work, published three or four years later on the same subject, how this happened. I had been introduced to this interesting question by the lamented Capt. Schultz. After the death of the latter, which unexpectedly happened the following year, I continued to search for the law of the tension of the wires, which he had sought without success since 1871. I had finally the good fortune to discover it in 1886 by a method analogous to that of Mr. Longridge, but much more simple. I was at that time ignorant of the work of the eminent engineer. If I had known of it I should assuredly not have continued this study for the mere pleasure of reaching the same formulæ by a more simple calculation. I continued elsewhere my work, turned out in 1887, by a comparative discussion of the different wire-wound guns then existing. The American translation of this book forms No. 48 of "Notes on the Construction of Ordnance."

Some years ago a well-esteemed work contained this summary and severe judgment: "An apparatus of this kind, very strong in one way and very weak in another, would be a deformed monster."

All that it would be right to say if this were exact, is that this cannon stronger transversely than others, but only as strong longitudinally, would not be more powerful as a whole; but it would still possess the additional advantage above enumerated. It would not be a "deformed monster."

But not only is a wire-wound gun not weaker longitudinally than another, it is much stronger, unless it has been purposely badly designed.

It is precisely this hooping by wire that led Mr. Longridge and Capt. Schultz at the same time to lay down the great principle of the separation of the resistances, consisting in applying to cannon the ideas which have for a long time obtained in other metallic construction:—To trust the transverse and longitudinal resistances to two distinct parts each submitted to a single one of these strains working solely by traction and at a uniform rate throughout their whole mass.

These parts are the threads and the jacket, the latter carrying the breech and the trunnions. The tube, reduced to a minimum, serves only to secure the tightness of the body of the cannon against leakage of the gases, and to carry the rifling. It is incontestable that this design is the most rational that can be imagined.

The separation of the resistances has also one more most important consequence from the point of view of the opposition of high pressure upon the cannon. The breech being carried by the jacket and not by the tube, there is no harm in increasing its diameter; the surface supporting the threads of the screw increases as the square; as the total pressure received by the screw is always the same (the product of the maximum pressure by the surface of the base of the chamber), the threads of the screw are relieved in the same relation. Thus a cannon could be designed firing under a greater pressure than another and yet whose breech should do less work.

Two causes led the principle of separation to follow naturally from the employment of wire. The first was necessity. It is clear that a cannon composed of a thin tube and of wire could not have had longitudinal resistance—besides the trunnions could not have been put on; a jacket then was indispensable. The second reason was a matter of convenience due to the system itself; the remedy stood side by side with the difficulty. As the thickness of the tube was reduced, and as the wire reinforce was much less than the ordinary reinforce, there remained a considerable strength disposable that could not be better employed than in reinforcing the cannon longitudinally, as had been done transversely; to trust this resistance to one special part, intrusted at the same time with protecting the wire against exterior causes of injury, was then plainly indicated.

Now, it will be noticed that this last consideration is permanent. The resistance to bursting will always demand a less weight of wire than of compact metal, whatever may be the progress made in metallurgy, for if they were to invent to-morrow a steel more highly resisting than wire actually in use, it would suffice to draw it into wire in its turn in order to improve the conditions for its use. So always the substitution of the wire for the ordinary

hoops would leave for disposition a certain weight that could be employed in favor of resistance to injury to the breech. This truth still misunderstood, cannot, then, be too strongly insisted upon.

With equal weights, the longitudinal resistance is better assured in a wire-wound gun, rationally designed, than in a cannon with ordinary hooping.

46. How has the ordinary prejudice come to be so firmly rooted? It goes back to the first cannon that Mr. Longridge had tried at Woolwich in 1856. This primitive engine was composed of a bronze tube, rolled around by steel wire, without jacket or trunnions; it was, in fact, a sort of trial tube which its constructor had already fired with heavy charges; the breach leaned against a wall. At Woolwich they had the unfortunate idea of fixing it by the flange at the muzzle; it broke at the second shot. The only astounding thing was that it resisted the first shot; but no matter, the legend was established, "Wire-wound cannon lack longitudinal resistance."

This was strengthened later in consequence of an unfortunate idea of Mr. Schultz, who, more especially for economical reasons, in several of his guns replaced the jacket by twelve bolts, binding between them a trunnion ring and a plate-locking apparatus. Theoretically he was right; twelve forged bolts certainly have a higher resistance for equal weight than a jacket of one piece. But in practice it was impossible, in spite of all the precautions taken, to fasten these bolts equally; they worked successively and unequally and they broke. So in his last cannon Schultz came back to the jacket, but the distrust remained.

After that time Mr. Longridge designed for England and for Russia cannon which have shown themselves to have greater resistance in both directions than those of any other constructor. In his last work he considers, even as a perfectly natural matter, a maximum pressure of 4725 atmospheres.

It is probable that upon this point he exaggerates a little. Mr. Longridge is a specialist among specialists; having found the means of giving to cannon the greatest possible resistance he quite naturally considers only that resistance. In reality many other conditions enter, which are in opposition, at least provisionally, to our doubling at one stroke the pressure under which our cannon work. But it is certain that the conditions which hinder us are foreign to the cannon themselves. It is certain that winding with wire from now on will increase the maximum pressure from 40 to 50 per cent., and consequently also the efficiency of cannon.

THE FUTURE OF HIGH-POWER GUNS.

47. Now, is it well in large armor-piercing guns to profit by all the increase possible in the efficiency? In other words, with every saving in weight, with equal power, is it always desirable on its own account? If we succeed in gaining something in thickness or in length, shall we not often find it advantageous to dispose of this gain in favor of some part previously neglected?

On this point also I think Mr. Longridge is right as against general

opinion; perhaps he pushes his argument a little to an extreme, but perhaps also he pleads for the greater to obtain the less, which of itself is not easy. The ideas which he has put forth in his numerous works can be condensed into the following propositions:—

To adopt the wire winding with the separation of resistances in order to carry off the maximum pressure. To establish conditions of loading in such a way that the pressure falls the least possible after the maximum, in order to utilize more the force of the powder.

As a consequence cannon would be much shorter than they are made to-day, and they would become almost as strongly reinforced at the chase as at the breech.

The benefit in weight resulting from winding with wire and from the shortening of the gun would be *usefully* employed in reinforcing the jacket at the chase in order better to protect the cannon against the rapid fire of the average projectiles, actually very dangerous.

As an application of these principles, Mr. Longridge shows that we can replace each cannon of 41.3 cm. of 110 tons, length 13.40 metres, by two cannon of 30.5 centimetres, of 45 to 50 tons, length 6.16 metres; or by six cannon of 21 centimetres of 16 tons, length 7.32 metres. The new pieces would answer all needs in the matter of penetration; and it is beyond doubt that their number, the increase in the number of projectiles that they allow to be carried, their ease of mounting, of service and of protection, the possibility of mounting them upon disappearing carriages, their greater resistance to the shock of the projectiles of medium guns, would give an immense superiority to the ship which should be armed with them.

I freely admit that we cannot yet think of facing 5000 atmospheres of pressure. It remains none the less certain that by applying to cannon a more rational construction, and in addition, more simple, we can at the same time force and improve greatly their conditions of loading. Even then, should we not follow Mr. Longridge to the end, we should at all events admit that he has indicated the true road to pursue in order to improve armor-piercing guns.

THE QUESTION OF EROSIONS.

48. But it is not everything merely to construct extremely powerful cannon; it is also necessary to preserve them.

We have just seen how we may hope to increase the maximum pressure of cannon in ordinary service; and we know that the solution of this problem is very desirable. But it is proper to say one word regarding the grave danger which this progress implies, even with cannon most solidly constructed. I mean the wear by erosion.

Erosions were a fatal and rapid cause of destruction in large guns firing the old powders. Certain of these guns had their regulation existence limited to the fire of 250 shots of full charge, which led to enormous expense for the renewal of material. These guns were in fact rapidly worn out in time of peace, since, to the shots necessary before they were received and those for trial of the carriage and as tests of their mounting on board-ship, a few were added each year for the purpose of proving their good condition and for personal instruction.

Among the different causes to which this destruction may be attributed, the chief are the ejection of liquid and solid substances from the bore, at a very great speed and at very high temperature, and the passing of the incandescent gases at high pressure between the ring of the projectile and the wall of the gun.

The first cause has disappeared with the old powders. The second has lost much of its importance, but still exists. The passage of the gases occurred in fact even when the cannon was new, either on account of an inaccurate placing of the projectile in its position upon loading, or in consequence of irregular wear, or of a partial stripping of the ring; but it rapidly became very considerable in proportion as the other hurtful causes dug deep channels in the surface of the bore.

To-day this passage of the gases will continue to occur as they formerly did as long as the bore is in good condition; that is so say, while they are rarefied and weak, and will produce only a very slow wearing away of the tube. But it may be feared that they will act more violently if we begin to fire cannon at pressures much higher than those thus far admitted; we shall then return to the day of rapid and deep erosions.

49. These erosions constitute, properly speaking, a chronic malady of the cannon, and with all maladies, the patient finds himself in the presence of two schools of medicine, the one extolling the preventive method, the other the curative.

The preventive medicine is represented by M. Maxim, who has proposed to prevent erosions from being produced, by employing projectiles whose face shall carry a true plastic obturator, a certain quantity of molten metal obtained between the body of the projectile and a mobile base would be constantly driven against the wall of the cannon in such a way as to close the seam between it and the projectile.

As to the curative school, it has for a chief Mr. Longridge, who wishes guns to be furnished with a thin interior tube that can be readily replaced once it is worn out.

I do not know whether the first method has been seriously put to trial. The second has, I believe, given satisfactory results in Russia. *A priori*, it does not seem that it could be very easy in practice; but it is not, on the other hand, easy to construct a new cannon; and yet that is what we are compelled to do if we will not repair the worn-out guns, and this repair is evidently less costly than reconstruction. On the other hand, if projectile obturators show themselves to be efficient, will they not be more advantageous? That is something which experience alone can say, experience which would certainly be long and costly, but which cannot fail to be undertaken, for its interest is evident.

(*To be continued.*)

CAVALRY IN FUTURE WAR.

BY COLONEL VON WALTTHOFEN (OF THE AUSTRIAN ARMY).

Translated by CAPT. WM. C. RAWOLLE, 2D CAVALRY.

(Continued from Journal No. 67.)

THE fourth and decisive stage of the battle—the culminating point of the bloody drama—occurs at the moment when the assailant proceeds to the actual assault, when his infantry masses are directed against what is seemingly the weakest point, and which effort the defense is endeavoring to meet with a counterstroke aimed at his flank. In this crisis of the contest each of the opponents will summon up all of his strength to bring about a favorable issue for his respective side; as a rule the reserves will have been called to the front to be thrown into the fight as a last resort, to wrest the victory that may be trembling in the balance. This particular phase of a battle will be infinitely more disorganizing and productive of a much greater nervous strain than was the case during former wars in consequence of the extraordinary improvement in fire-arms of all descriptions, and which, by the way, is not to be considered as having reached its limit. The magazine rifle, with its increased intensity of fire; the flatter trajectory and greater penetration of the small calibre arm, smokeless powder, etc., will bring about this result. The present perfection of weapons will, however, permit of a dense firing line capable of delivering only a moderate fire to be replaced by a thinner line, the intensity of whose fire would be greatly superior; this again will allow of a much greater expansion of front, the possibility of enveloping the opponent and delivering the principal blow against his weakest point, the flank, without running much risk of having the front of one's line pierced. In battles of the near future, tactical turning movements, involving attacks and counter attacks in flank, will therefore become a prominent feature with both parties. But to assure the success of a flank attack, it is a fundamental maxim that it must be made in connection with a frontal attack, bearing in mind that because of the distance to be traversed it takes longer to prepare the former than the latter; it follows then that the execution of the flank attack ought to devolve upon the arm which is capable of reaching that point the soonest.

Cavalry, however, will in such a case only succeed in efficient coöperation when it is of imposing strength and adequately supported by artillery. In battles of the future the interference of a few isolated regiments will hardly avail; entire divisions of cavalry, in fact as many of these as can be readily assembled, will need to be thrown into the fight at this decisive moment and with all vigor—there must be no hesitation, no half measures and no unskilful handling of the arm. At the decisive point and the decisive moment one is never strong enough, for the opponents' cavalry, presumably being alive to the performance of its duty, will have to be encountered and driven from the field before the second and more difficult part, engaging in the front attack proper of the enemy's infantry, can be undertaken.

In the actual course of the battle, as in the first two phases of the campaign, *i. e.*, the strategic assembly, and the preliminary operations, it will be the primary and most important duty of the cavalry to dispose of that of the enemy—the influence of the latter will never be thoroughly paralyzed until it has been dealt a crippling blow. If this is not done during the decisive period of the contest, the force destined to bring about the issue will have to be increased to such an extent that not sufficient will remain to engage in the main action. When it is therefore desired to prepare the most favorable conditions for the interference of one's cavalry it is an absolute necessity that that of the opponent be first defeated. To be able to engage all three arms of the enemy at the same moment when acting in combination was not even possible in the days of Frederick II.; the great king as a rule caused his cavalry to attack that of the foe, and when this had been defeated and separated from its infantry, the victorious squadrons were then hurled against the enemy's flank and rear to bring about an issue.

To insure the success of a cavalry attack on the enemy's infantry, undertaken at the moment a decision is desired, the following conditions need to obtain:

1. The attack must possess a due element of surprise.
2. It must be made with all available strength and executed with the greatest force and energy.
3. If possible it ought take the enemy in flank or rear.
4. The attack must be conducted with uniformity and the separate units must remain closed and not lose their cohesion.

In battles of the future it will be possible to realize the first condition, surprise, more frequently than one would imagine; for in the heat of the contest when both sides strive for a favorable result and the infantry assaults are met by counter charges, the fighting masses will be so preoccupied that they will be quite ignorant of what transpires in their vicinity and hardly realize the approach of hostile cavalry until these are almost upon them. So far as the introduction of smokeless powder is concerned this will make but little difference as compared with the conditions existing before its invention, for it too creates a low hanging cloud (even if not as dense as that of the other) forming a veil to obscure the vision after a fire contest of the masses of infantry and artillery has raged for hours; then too in future as in the past favorable features of ground, conditions of weather such as fog and mist may contribute towards concealing the direction of the attack from an enemy who at best has plenty to do in his front. The second condition, to engage with the greatest available strength is one of the difficult problems the cavalry is obliged to solve at this particular stage—those of less consequence can be left out of account, for if this is solved, all minor issues involved fall to the victor anyway, moreover, if the principal undertaking does not succeed then the less important if secured would be quite valueless. Again cavalry attack on infantry has a prospect of success only when it is properly sustained, that is, when the force consists of a necessary number of lines and these are led in a concentric form against flank and rear or front and flank of the body of troops to be engaged. For this

purpose a powerful force is requisite, capable of employing a number of successive lines, which by their irresistible impetus will break the enemy's resistance at any cost. It is only by uniting a number of cavalry divisions into a corps and using this large mass for the execution of a uniform attack especially at the moment that a decision is to be sought, that a successful issue may be expected. This is recognized by the German cavalry drill regulations of 1886: par. 185 of these especially prescribes that "all available cavalry divisions will be assembled and placed adjoining one another, under the command of a single chief, so as to be ready to participate at the decisive moment; at the same time several brigades will be echeloned at the exposed flank and prepared to meet any of the enemy's cavalry."

As to the manner of doing this; that is the formations, distances and intervals to be observed, the direction to be taken by this great body of horsemen to reach the enemy's infantry and perchance his artillery I will not discuss any further, since almost all that is covered by the regulations. It ought not be omitted to state, however, that in attacks upon infantry as well as artillery it is necessary to resort to a first, second, and third line; it is required of the first to break into the enemy's formation; it belongs to the second to complete this aim and to turn on such portions of the enemy's formations as have escaped—the third line, the available reserve must not be drawn into the fight prematurely, however, it will have to be sent in unhesitatingly when it becomes apparent that only with its assistance will it be possible to succeed. It is to be understood that each squadron will select its own object of attack and when engaged act independently; that the distance between lines must not exceed 150 to 200 paces; finally it is to be remarked that in an attack on artillery it will often be advisable to cause several detachments of the first line to advance in extended order and that those men who are armed with the revolver will, in dealing with infantry and artillery, find it a much more effective weapon than their sabres.

Since in all battles it is the aim of the assailant to destroy his opponent or to do him the greatest possible harm, it is very natural that resort should be had to those means which promise the greatest amount of success; these are the cavalry attacks against flank and rear, as a consequence of which one defeated body is driven upon another and the line of retreat is intercepted. In general battles, every engagement of large bodies of cavalry should have for its object some strategic aim; it is not only desired to defeat the enemy (which of course remains the controlling idea), but to force him into such an unfavorable situation after a victory as will render him incapable of offering resistance for some time to come. This is best accomplished by a cavalry attack against the flank of the opposing force or better still taking it in reverse; such a procedure promises the greatest results, offers every advantage of being able to appear unexpectedly and in close formation, to strike the enemy in his most vulnerable points and perhaps prepare a catastrophe for him—these therefore are the most desirable directions to be selected for attack and when circumstances admit of it are the ones to be chosen.

The extraordinary effect of an attack in flank by large masses of cavalry in a general battle can and will be had if this is only arranged for at the

opportune moment and well conducted. Independently of the enfilading fire of the accompanying mounted batteries to assist in the charge being driven home, the cavalry in extended front will strike the narrow flanks of the infantry lines, hurling the opponent's forces one upon another. At this critical moment it will not be so easy a matter for infantry to execute a change of front, besides their endeavors and attention will be directed to those in advance, it being perhaps necessary at this time to hurry forward reinforcements for the firing line to meet an infantry assault. The cavalry would enter between the enemy's lines, assailing them from all directions and preventing them from rendering mutual support. It will be so much easier to destroy the fire discipline of companies and battalions in this moment of great excitement, since it is no longer considered a *conditio sine qua non* to form squares in repelling cavalry; it being expected and laid down in the regulations that cavalry can be repulsed by infantry in extended order formations. The irregular fire resulting from the charge of the second line will then be conducted without aim or object for the noise and confusion of the fight will drown all words of command; in the end the different detachments and groups will be left to their fate.

That cavalry in attacks of such large masses will suffer great, possibly very great losses is not to be denied; however the arm does not exist to be nursed and petted simply because of its expensiveness, but to render its army useful service under any and all circumstances. Should it be possible to gain important results with comparatively small loss, whether in the preliminary operations or on the field of battle, will be a matter for congratulation and redound to the credit of the cavalry chiefs in knowing how to make an economical and profitable use of the instrument placed in their hands. If however the end in view can only be gained by the sacrifice of many lives, providing the occasion is worth it, the cavalry general will not hesitate to launch his force into the fight, regardless of loss, in order to secure victory to the cause.

A charge of cavalry on infantry, has at all times called for great sacrifice. When Seidlitz, that ideal cavalry general, attacked the Russian infantry, on the afternoon of Zorndorf a second time with a force considerably fatigued from a previous attack on cavalry, he left 21 per cent. of his numbers stretched on the battle-field, for of the 7000 cavalry (61 squadrons) under him, 78 officers and 1267 men had been killed or wounded. Seidlitz's cavalry, too had as difficult a task before it as will ever fall to the arm in future—for the solid Russian masses of a twelve rank formation, the front ranks meeting, and at a "charge bayonet" received the Prussian horsemen with so destructive a fire, joined in by the Russian batteries, that entire ranks of the cavalry sank to the earth in their advance; disorder began to manifest itself and the first line to waver. Causing the signal of the charge to be repeated, the resolute leader having full confidence in the valor of his troopers rode down all the Russian lines with them. A most desperate hand-to-hand encounter ensued (for it is only a dead Russian who is vanquished), such as is but rarely recorded in military history, resulting as it did in so brilliant a victory for the mounted arm.

As well now, as in Seidlitz's time and before, will it be possible for cav-

alry of sufficient strength if skillfully handled and resolutely launched forth at the opportune moment, to be like unto a spring-tide, ready to overwhelm the surprised opponent, carrying everything with it that does not avoid its destructive path. But this can take place only under the primary condition that the cavalry must itself feel convinced of the irresistibility of its charges; it must believe that the days of its glory not only belong to the past but that these may be sought in the future. Cavalry must be thoroughly possessed of the idea that a timely and impetuous charge is as irresistible to-day as it was of yore and that in future it will contribute towards deciding battles if it has a mind to; if it is prepared to suffer the severest losses, when the occasion demands, in order to secure success, for without this the great drama of the world's history has no trophies to show.

All this the anonymous author of the "Military Essays" controverts by saying, that most recent military history, especially that covering the campaign of 1870, has nothing to produce but a long list of failures of cavalry when opposed to infantry; that all attacks of the French cavalry were defeats, and that of those undertaken by the Germans—at Mars-la-Tour—only the two least significant ones met with any measure of success. These examples present only an apparent proof when it is not attempted to institute a critical search for reasons and one does not closely examine the real cause of the failure of cavalry attacks on infantry during that campaign. Let us engage in such an investigation and look closely into the facts so as to determine whether these ill results were owing to an inability of the arm to fulfil its functions or whether there were other causes accounting for this state of affairs.

The French cavalry attacks of 1870 were not successes because they were neither properly or opportunely undertaken; the French horsemen thinking that simple bravery would be sufficient to gain results, whereas a thorough peace training and able leadership were the qualities needed. In almost all their attacks they reached the enemy's lines of infantry; at Morsbrunn the French cuirassiers pass between the squares; at Sedan they first charge through the intervals separating the German infantry commands and returning do so a second time; du Prenil's brigade of the Guard at Vionville is on the point of succeeding, a colonel and his adjutant having actually broken into a square but their cuirassiers again leave it in the face of a galling fire.

It is an established fact that the attacks of French cavalry were not frustrated by the enemy's fire, for in their advance they hardly ever sustained such losses as would have compelled them to turn about; it was simply because of a disinclination or inability to break into the enemy's lines of infantry to which they had arrived without particular loss. If the French cavalry could ride through the zone of fire so as to reach the enemy in an effective condition and charge past his array of bayonets, it could as well and with less sacrifice have broken into his lines and silenced his volcanoes of destruction.

The aim and object of every cavalry charge is to break into the opponent's forces. If this has been accomplished then the very best fire-arm the infantry may have will be of but little use to it; in that case the infantry

will have to succumb to the vehemence and fury of the shock and find itself obliged to engage in a hand-to-hand encounter in which the cavalryman has every advantage. But to incur a reckless slaughter of men and animals to reach the object of attack, then to neglect reaping the reward of a fearless and self-sacrificing spirit in so *mal à propos* a fashion is not proof at all that cavalry is powerless when opposed to the improved rifle and modern infantry tactics! it simply proves that the French cavalry of 1870 was deficient in training and was not under the control of its leaders, furthermore that it had not been taught the very first fundamental principle that whatever arm of the enemy cavalry attacks, it must absolutely break into his formations, ride over him so as to vanquish him in close combat. The special function of cavalry, says Kanitz in his excellent work, entitled "Information and Reflections Concerning the Deeds and Destiny of Cavalry"—"is the attack with lance or sabre. That was its function under Frederick II. as well as under Napoleon I. and will continue to be in wars of the future.

"The cavalryman is not provided with a horse and sabre to frighten the enemy away but to close with him and then to vanquish him. When sabres have been drawn and the fateful charge has been sounded there is no other direction to choose but that which leads to victory, straight at the densest masses." No matter how good a fire-arm the infantry may possess, an impetuous charge undertaken by good cavalry having nerve, will result in throwing the infantry formations into a state of chaos in which condition they never have been or will be able to oppose the irresistible shock of cavalry.

One must not fail to note that the attacks of the French cavalry at Woerth—especially that of Bonnemain's division—were bound to end disastrously from the manner in which they were conceived and executed. The result would have been the same had they been undertaken against the old muzzle-loading musket. To charge without positive and definite orders through vineyards and hop-plantations on a firing line with adequate supports concealed and under cover and additionally protected by a wide and deep ditch which had a border of trees on each side of it, was a display of worse than incompetence, it was sheer madness! Of what use were the close alignment, determination and precision of the gallant and magnificent French cuirassiers when they advanced to the charge. They were fated to death from its very inception, for the rapid fire of the enemy caught them while in a helpless entanglement, and fearfully decimated they found themselves compelled to turn about before they could even cross the ditch.

The handling of Michel's brigade at Morsbrunn was not less unfortunate in its results. While this brigade was descending quite a steep slope, crossing hop fields and passing between patches of timber which compelled the 9th Cuirassiers to break into column and then to reform, it received a most severe infantry fire in front and left flank, nevertheless it charged through the intervals separating the Prussian squares and into the village of Morsbrunn which it had to abandon after having suffered very material loss from infantry concealed in the buildings, then on reaching the open it was assailed by Prussian cavalry and utterly destroyed. Again one asks involuntarily,

why did not the brave French cavalry ride into the squares? Why did they not in spite of the cross fire they received (and which as we again see did not stop them) break into the infantry formations which they reached instead of passing through the intervals? What good could result from entering Morsbrunn? Would it not have been wiser if the brave cuirassiers, who notwithstanding much sacrifice had reached the foe, had proceeded to break into his formations and had exacted a fearful retribution with their blades for the losses inflicted upon them during the advance?

To this there is but one reply, the French cavalry lacked individual and thorough training, their horses were neither well prepared or obedient, the instrument was in fact imperfect because not under control of its chiefs; the old cavalry drill regulations of 1829 (!) proved to be inapplicable. All this was fully appreciated by the French cavalry generals after the campaign and hence their zeal since 1870 to remedy the evils which had manifested themselves, to improve school and cross country riding, to perfect the training of their mounts, in fact to bring the arm to such a degree of perfection that it will be equal to the performance of any and all duty cavalry may be called upon in future. The opinion now prevails in the French army—for that matter in all others—that in future wars only that cavalry will be of any value, and capable of contributing towards a tactical or strategic success which has been thoroughly trained in all of its particular duties and is equal to performing the duties required of it. This is evidenced by the essays in the *Revue des deux Mondes* and the *Revue de Cavalerie* which have been mentioned heretofore.

If we will now consider what was done by the German cavalry in general engagements we need above all to examine the occurrences of the 16th of August, which to them was a day of glory, and to determine impartially whether as is maintained by the author of the "Military essays" they have nothing to show but a series of ill successes when opposed by the rifle.

In the first place 37 squadrons with 24 guns drove a surprised enemy, indulging in comfortable repose, from his camp, creating more or less of a panic with some of his wounded troops. In their farther advance this force, which had been reinforced in the meantime by the 6th Cavalry division (16 squadrons and 8 guns) to a total of 8250 men and 32 guns falls upon 6½ divisions of the hostile infantry (65,000 men), threatens them in flank and rear until sufficient time has been gained to enable their own infantry following them to prepare for battle. The German cavalry generals displayed sound judgment in refraining from engaging in any contest with the hostile infantry, which would not have resulted in any advantage to themselves, and they confined themselves to the object desired, viz., to reconnoitre and hold the enemy without committing themselves to a serious encounter, in this they succeeded and with only a nominal loss.

After the Prussian infantry had gone into action the cavalry for two hours formed a support for the thin line then engaged; this force consisted of the 3d Corps and Lyncker's detachment and was confronted by three French corps. The progress of the Prussian infantry was of so decided a character, notwithstanding the superior numbers of the French, that Bazaine

felt obliged to call on his cavalry to give relief; while at the same time General Alvensleben, commanding the 6th Cavalry division, ordered a pursuit, to follow up the infantry's advantage. This led to cavalry attacks of great and small dimensions which ended, however, without results from the fact that the cavalry struck infantry not at all disordered and also because the attacks were undertaken with entirely too small forces—squadrons, at most one to two regiments. Then again let us be frank and confess that in some instances, these were not judiciously managed. (This refers to the attacks of the 14th and 15th Brigades. For details see Kähler.)

When towards noon the French infantry had been considerably reinforced the thin line formed by the 3d Prussian Corps could hope for nothing more than to hold its ground until the arrival of the 10th Corps. In the meantime a portion of their cavalry was again used as a support or second line while the bulk was sent to a point in front of the left flank of their position where two of the enemy's corps were in the act of deploying. As Marshal Canrobert directly after proceeded to the execution of a determined attack, the danger existed that the 3d Corps of the Prussians would be crushed by this superior force since the last reserve had been exhausted and the nearest assistance, the 20th Division, was still at some distance. At this crisis of the battle the corps' commander, therefore, deemed it a matter of the greatest necessity to order Bredow's cavalry brigade to the attack (6 squadrons—800 men; 2 squadrons were at another part of the field). To silence the French batteries in position along the ancient Roman road which were inflicting severe losses was to be General Bredow's first objective. Breaking his six squadrons into a column of squadrons, he moved along a small parallel to the French position and about a thousand paces from it in order to reach a point closer to the batteries. Under cover of the slope the brigade formed columns faced to the right flank, then front into line and on reaching the crest advanced to the attack at a gallop.

With this single, thin line, without a man in reserve, the brigade broke through the firing line of the hostile infantry, cut down the gun detachments of the batteries, trampled the second line of the infantry under the hoofs of their horses at which moment several batteries posted farther to the rear limbered up and moved off. Having thus advanced a distance of more than 3000 paces, the exhausted horsemen were now charged by two fresh divisions of the French cavalry, who attacked by regiments (Forton's and Valabreques) compelling them to retire in the direction of Vionville where, after having sustained fearful losses they were rallied.

The anonymous author of the "Military Essays" together with other literary critics, however, condemn this charge of Bredow's brigade as useless, without result and as a totally unnecessary slaughter of precious lives. Of course the sacrifice was enormous, a loss of 409 of the 800 (consequently over 50 per cent. *). But then what was this loss as compared with the results obtained? The French offensive was stayed for the balance of the day; at least they did not undertake another advance from the direction of Rezonville. Their troublesome batteries had been silenced; the teams and

* During the day this brigade had suffered some loss before the charge, that would somewhat lower the percentage.

gun detachments destroyed and the German firing line enabled to advance several hundred paces to a better position. The French cavalry though—and which by the way is entitled to the credit of forcing Bredow's brigade to retreat, not their infantry—was thrown into such confusion that it was compelled to retire to the ravines at Rezonville to reform. However, that which is of most importance to our consideration of the subject is that 800 horsemen broke through nine battalions and five batteries, cut down the gun detachments of the latter and were only compelled to turn about when their horses being exhausted they were met by a cavalry force five times their number, neither the enemy's infantry or artillery having been able to stop them. And that is described as not being a brilliant result of a cavalry charge. I put the question, what might not have been achieved had Bredow's brigade been duly supported by two or three others, in fact by but one or two following in the wake cleared by it, to gather in the fruits of victory? In that event the battle would probably have ended at 3½ to the advantage of the Germans instead of lasting until 7½ at night and remaining undecided.

It behooves critics to be just and considerate, not to belittle the deserts of an arm of which it is most inconsistently expected that it sacrifice itself on occasions when matters go wrong, *i.e.*, when the "queen of battle-fields," the infantry, finds itself in a tight place. For the accomplishment of positive results, by which is meant a due coöperation in reaching an issue and to secure victory, the cavalry will ever fearlessly incur all necessary sacrifice, but to employ it in a negative sense, that is to require it to extricate the sister arm from a possible catastrophe, this highest proof of soldierly unselfishness should only be exacted from it upon the rarest and most urgent occasions. Depressed with a feeling of inevitable defeat or at least with the gravity of the situation before them, to engage in that which will result in the severest losses, with no trophies or thankful recognition to look forward to, is a position which calls for the most eminent sense of duty and more than an ordinary heroic spirit. And that character of service was repeatedly demanded of the Prussian cavalry in the battle of the 16th of August, where, imbued with a full and loyal sense of duty it responded cheerfully on every occasion. This also applies to the 1st Dragoons of the Guard who at 5 o'clock in the afternoon in consequence of their charge on the 4th Corps of the French rescued its 38th Brigade of infantry, in just the same manner that Bredow's brigade had saved the 6th Division of infantry. Their losses were of course also heavy for almost a third of the gallant horsemen lay stretched on the field, however, these bore no proportion to the results achieved, rescuing an entire infantry brigade and thereby avoiding an otherwise inevitable disaster.

Some critics assert that the cavalry encounter later in the day, between 21 Prussian and 20 French squadrons, northwest of Mars-la-Tour, was a useless cavalry duel. Tactically it was eminently proper that the Prussians should have placed their available cavalry at their left in order to protect that flank against the superior force of the French which threatened it. The French making equally correct use of their cavalry, sending it to

the same flank to cover the advance of their infantry, it follows that a collision was bound to happen. As has been stated on a preceding page, this will have to come about in future battles where proper use is made of both mounted forces, for the victorious cavalry will not until then be able to proceed to the second of its functions, to coöperate offensively or defensively in securing a result. That the Prussian cavalry which was victorious in this encounter, in so much as it compelled that of the French to retire, failed to follow up its advantage, is explained by Major-General Barby in his report wherein he states that the fatigues of the preceding days added to much riding about the battle-field over soft soil and hilly country had used up their horses. This example teaches the lesson how very important it is that cavalry commanders of whatever grade should husband the strength of their men and animals in all phases of a war, especially before an expected battle and even its earlier stages. The better the condition a cavalry command enters into an engagement, the greater its prospect of success; nothing undermines the physical and moral qualities of mounted troops so much as a useless riding back and forth. It is for this reason that in all situations a cavalry officer ought ask himself, how can I achieve my object with least fatigue to the command? Which is the most direct method of accomplishing my purpose at the same time sparing men and animals the utmost? Above all let him beware against using up his horses, for cavalry there is no more deplorable a condition than that of exhaustion on the eve of an encounter with the enemy.

Marmont convincingly observes in his superior work "*Sur l'Esprit des Institutions Militaires*," concerning the double duties of a cavalry general when opposed to that arm, "that up to the moment he is called into action he needs to devote the most particular attention to the care of his command—both men and animals—to see that its efficiency is in no way impaired. However, upon arrival of that moment he must launch his force into the fight regardless of losses, with this proviso only, that he use it so as to derive the greatest amount of benefit. It is but rarely," Marmont adds, "that a cavalry general will fulfil these conditions in equal degree."

With this general statement it is not intended to cast a reflection on those who handled the Prussian cavalry at Mars-la-Tour. In this battle the duties required of them were especially difficult because of the opponent's greatly superior force. Then, too, it was not possible to be particularly sparing of the horses as is evidenced by the narrative of the different encounters. Whether, as some maintain, this last attack of the 6th Cavalry Division ordered by Prince Frederick Charles at dusk and made in connection with one by the 3d Corps to force a decision was advisable, is doubtful. Owing to the darkness then prevailing and the consequent impossibility of seeing the enemy's forces distinctly, together with the exhaustion of the horses, which had been under saddle since 2½ in the morning, having been neither watered or fed (the men were no better off) were circumstances which held out no promise that the contemplated charge would be successful. Whether this last charge of the cavalry on the 16th induced the commanding general of the French to desist from making a general attack at dawn of the 17th with his untouched reserves, which out-

numbered the exhausted forces of the Prussians and which as some claim would undoubtedly have resulted in the defeat of the latter, probably ending in forcing them back to the defile included between Gorze and Thiancourt is very questionable. By the morning of the 17th the commanding general of the French must have known that on the day before he had to deal with but a small fraction of the enemy's army; he must also have been aware that the greater portion of the latter's forces had already crossed or would cross the Moselle by noon of the 17th and that it was better policy not to engage in an offensive battle, in a country abounding in good defensive positions for his opponent, with an army which had received some hard knocks. The entire reserve of the French army amounted to four divisions of infantry; these would not have been sufficient to turn the balance in their favor, for on the morning of the 17th the Germans had an equal number of fresh troops to oppose to them. Withdrawing his army to a well prepared defensive position which had the advantage of the support of that powerful fortress Metz, there to await the assaults of the enemy with every available man, was decidedly the best strategic course for Bazaine to pursue. The relentless charge of the 6th Cavalry Division on the evening of the 16th had certainly nothing to do with his adopting it.

In a further consideration of the employment of cavalry in engagements of the campaign of 1870 we must admit that it was not always in the positions it should have occupied on the battle-field. To deduce from this though, that cavalry has been rendered powerless against the other arms would be a false conclusion and which if fostered would ultimately redound to the injury of the arm and to armies generally.

As an illustration of this, reference might be made to the engagement at Artenay, where if the Germans had given the necessary orders to their 2d Cavalry Division they would have had on hand a total of $2\frac{1}{2}$ divisions of that arm together with all the batteries belonging to them, a force which if opportunely and properly employed would probably have changed a simple defeat of the French into a complete rout. If at Coulmiers—the only battle of the war of 1870 resulting unfavorably for the Germans—the 24 squadrons with their batteries had assailed the left wing of the French which advanced without any protection of its flank, such an attack would in all probability have ended in a victory for the Germans and a capture of the trains of the Army of the Loire.* It is to be regretted that the commanding general (Lt.-Gen. von der Tann) did not see fit to do so; perhaps for the reason that he wanted to reserve his cavalry for an emergency. No fault is to be found with the cavalry or its generals, especially since after the loss of the battle they did their full measure of duty in covering the retreat.

As regards the French a critical examination of the events of the battles of Woerth, Gravelotte and Sedan makes it equally clear that it would have been to their advantage had they posted their large bodies of cavalry at the right of their positions as they did at Vionville, instead of in their front. All the battles were decided by a turning movement of the left wing of the Germans; much of the surprise, rapidity and persistent pressure of

*Lieut.-General Colomb expresses the same opinion in his "History of the German Cavalry."

these attacks might have been counteracted by a proper use of the French cavalry. By an opportune and energetic employment of this arm, time might have been gained to enable the infantry to repulse them.

It may be accepted as a certainty, that in future wars German generals will not be guilty of these mistakes, but when occasion demands they will unhesitatingly launch their cavalry into the fight. Par. 160 of the cavalry drill regulations provides for this; the closing sentence reads: "Contingencies may arise in battle which will call for the unhesitating employment of cavalry, even against infantry which is not disordered and against artillery. Results can only be obtained by the united and vigorous action of large bodies of cavalry." This more than warrants the employment of cavalry against infantry which has not been thrown into disorder.

We see from this and other requirements of the regulations, that for the future the Germans—and very properly—look forward to employment of cavalry on an extensive scale. The aim of the French is in the same direction; since 1870 their cavalry has been increased by 28 regiments; they have revised and improved their regulations, they have excellent opportunities for training officers and men in their manoeuvres of cavalry divisions at Chalons as explained in the essays published in the *Revue des deux Mondes* and the *Revue de Cavalerie*, they too lay special stress on the active employment of cavalry in all phases of a campaign and particularly in battle.

Let us summarize the author's views of the first mentioned essay and compare them with ours.

He says of the various employments of cavalry, that, calling for its use in battle is the one concerning which the most diverse opinions exist. In the recent past its ability or even possibility of effecting anything on the battlefield has been systematically denied. But the arm has never ceased to protest against that assumption. If by a study of campaigns one endeavors to ascertain the causes which contributed towards elevating or diminishing the value of cavalry, it will be found that its important or inferior achievements in battle had no connection whatever with the inferior or improved fire-arms in use, but that on the contrary these were entirely due to the system in vogue governing its training and employment. In short its character depends exclusively on the command and control exercised over it. Military history during all times is evidence of this. For if such had not been the case the cavalry of Frederick II. would have accomplished less than that of Charles V. and the mounted arm of the First Empire would necessarily have been limited to less brilliant achievements than those obtained by Louis XIII. and Louis XIV. The value and effectiveness of cavalry is therefore not measured by the effectiveness of fire-arms but entirely by the ability and character of those whose duty it is to train it and who understand how to exert a magnetic influence over it in leading it to battle.

THE NEW REGULATIONS FOR FIELD FORTIFICATION IN THE GERMAN ARMY.

Translated from the *Rivista di Artiglieria e Genio*.

By LIEUT. THOMAS C. PATTERSON, 1ST U. S. ARTILLERY.

THE importance acquired by field fortification with the increase in the power of arms is apparent to all. The events of the war of secession in America, of the campaign of 1870-71, of the Carlist insurrection in Spain in 1874-75-76, of the Turco-Russian war, of the brilliant but brief Bulgarian campaign against the Servians, already commented upon by so many eminent writers, have demonstrated what a potent factor of success, even for a body of troops of inferior strength, is the ability, at a given time, to make skilful use of field fortifications to preserve or increase the offensive power of an army. And in future wars, in which smokeless powder, small calibre arms, rapid-firing guns, the new forms of shrapnel, and the use of high explosives will contribute to render the contest more brief and sanguinary, it will be still more necessary to know how to construct defenses, create or destroy obstacles, and utilize the irregularities of the ground, because the need will be greater to withdraw from the view of the enemy in order to prevent him from accurately regulating his fire. Still greater is the need to feel relatively secure behind intrenchments, in order that the troops may be more calm and afterwards make more effective use of their respective arms. That such necessity is felt on all sides is proved by the number of intrenching tools with which most armies are now provided. In France the number of such tools is 14,000 for each army corps, for the infantry and engineers alone. In Germany the allowance is also 14,000, not including those for the artillery and cavalry. In Austria the allowance is 15,000 for the infantry and engineers alone. To realize, however, the service which field fortification may render, more is necessary than the knowledge of its use on the field of battle. Fortification is an art and like other arts must be practised to bring out its value. Brialmont predicts the defeat of any army which "neglects this precious element of strength." Cardinal von Widdern writes "that the task of the attack will in future be most frequently the conquest of fortified positions" and Captain de Guise endeavors to "reëstablish in its true value, too often ignored, the tactical value of temporary fortifications," but these maxims are of no avail unless armies know how to make use of fortification as of their own arm, adapting it to the nature of the combat and of the terrain. What has been done hitherto in this way? Very little. Even in Germany field fortification has been considered as a specialty of the engineer arm: the infantry was trained, probably more than elsewhere, even in siege works, but always under the direction and control of an engineer officer. It was therefore natural that infantry officers did not consider it as concerning them.

The same in France, for however appropriate the instruction in field fortifications may there be to the infantry, but one chapter of the first part

of the manual of instruction in field operations, comprising 38 pages only, is devoted to intrenchments, redoubts, the utilization of the irregularities of the terrain and obstacles. In France also it would then seem that such works for the infantry have not been estimated at their true value. Not less favorable to such works are the conditions in Italy, but the special instructions for the pioneers of infantry and cavalry occupy but few pages in the hasty fortifications. We may add that with us the allowance of pioneer tools is very limited, being for an army corps only about 3500, too heavily loaded on wagons which often are far from the combatant troops. A new epoch, however, is opened for field fortification by the manual adopted this year by the German army. This establishes as a general rule that *the defensive arrangement of a given position is made by the troops who are to occupy it*. The infantry, therefore, should be able to undertake alone all those works of the simpler kinds which may be required, and the field artillery should undertake its own defense. For the cavalry there exists a special instruction, and also for the fortress artillery.

The pioneer companies are no longer told off, as in the past, to initiate the work, or to provide instructors. They are employed entirely at such points as may call for works difficult of execution, or where it may be necessary to use a large force to accomplish much work in a brief time.

In field works are comprised those pertaining to the siege of a fortified position or of a fort serving to protect heavy guns or facilitate the sortie of infantry; such operations are undertaken in common by the infantry and pioneers, the latter furnishing advice and instruction in matters requiring special technical knowledge; but the infantry works always under the supervision of its own officers.

Fortress artillery, which is often called upon to reinforce positions in the field, performs its work either alone or in conjunction with the infantry, in the proportion of one company to each battery. Such coöperation proves especially advantageous when the battery may be called upon, as soon as the guns are in position, to open fire, in which case its men should be fresh and in good condition.

The new manual is therefore devoted to the instruction of the pioneers, the infantry and the field artillery, and this marks a most notable progress. For those exceptional cases in which it is absolutely impossible to attack a fortified position, either in field or siege warfare, except by carrying on the work of the approaches under cover, we find a brief appendix giving the established rules for undertaking the attack regularly, for the use of the pioneers only. Otherwise the normal form of battle intrenchment is used, constructed always in the same manner and by the same troops, serving equally for cover for the sustaining troops or for firing positions; such works are called parallels or approaches, and are used for either purpose both in field warfare and in sieges.

The instructions are divided into three parts. In the first are set forth the general rules as to the scope, the employment and organization of field fortifications. The second gives the rules for the execution of field works and the third treats of the works of attack to be undertaken in common by the infantry and pioneers against a fort or a fortified position in the field.

Five appendices follow, of which the first four contain data relative to the number of tools to be distributed to the troops, the dimensions of parapets, the investment, and the mode of placing sheets of corrugated metal already prepared for use as head cover. The fifth treats of the construction of parallels for regular attack, already alluded to; the works described in this last appendix are not undertaken by the infantry, neither are those pertaining to the defensive work of the artillery, the defensive arrangement of forests, or the construction of redoubts.

The material contained in the first part may perhaps hitherto have been found in treatises on tactics and fortification. But the young officer who goes to his regiment fresh from the military school has at first too much to do to occupy himself with such treatises; he will find elsewhere the needed experience to enable him to select such principles as will serve him in practice. The reserve officer called into service in case of mobilization, or the former non-commissioned officer who is to take the place of an officer, certainly would not read such works. It was therefore a wise measure to collect in compact form the plain principles, based on sound tactical views, regarding the scope and the employment of fortification and the selection and defensive arrangement of a position.

The commander of the troops, the instructions say, should make use of fortification for the attainment of the object which he has already decided upon and should not allow his decisions to be subordinated to it, as might happen if the works are begun before a clear idea is formed as to the object to be attained; the premature reinforcement of the terrain is pernicious and an obstacle to freedom of movement.

As to the choice of positions, the instructions point out the need of viewing the ground from the highest point in order to find ideal positions, on account of the great extent of ground that must generally be occupied. It is not well to attach too much importance to the difficulties confronting here and there a given position. These may be successively seized, if need be, with opportune reinforcements.

Great obstacles in front, however, are to be avoided, because these are of assistance to the enemy in turning movements and impede the counter-attack of the defense. They may be of service, however, when such turning movements are out of the question or where the defense wishes to gain time. They are then of advantage when a position is to be occupied for a long time. A principal requisite is a clear field of fire. It is of great importance also to retain the power of concentrating the fire of the artillery and infantry on the probable direction of the attack, and also to cause the two arms to act in combination at the critical period of the combat. Forests or covered ground will be advantageous if near the front of the occupied position and especially on the flanks. They will be of great value to the defense if the conformation of the terrain is such as to impede the full employment of the attacking artillery and if they favor the movements and inter-communication of the troops of the defense. It is advantageous to have on the flanks difficult roads or obstacles not easy to surmount.

The rules for the defensive organization of a position constitute perhaps the most important part of the instruction, and are here given in full.

" Before fortifying a position it is necessary to have a clear idea of the disposition of the troops who are to occupy it.

" Advanced positions are not to be occupied except as outposts. These conduce to the defeat of the troops thus pushed forward, and mask the fire of the principal positions. It is better to strengthen *one line* and powerfully.

" The time available for the execution of the works depends on the general situation. Before all else the freedom of the field of fire must be secured; this is the most important consideration in the construction of defenses. This being accomplished, the rapid execution of the work follows, such forms being chosen as may afterwards be strengthened. As far as possible the trenches should be concealed from the view of the enemy, and therefore must be adapted with great care to the conformation of the ground.

" Instead of occupying the crest, it is better to advance the infantry on the slope descending toward the enemy, withdrawing the artillery behind the crest so that the muzzles only of the pieces shall be exposed.

" Parapets and other cover should have the lowest altitude possible, and should present at all points a uniform appearance, similar to the surrounding earth.

" It is often inadvisable to occupy the perimeters of forests, large houses, villages, etc.; the trenches should be established as far forward as the freedom of the field of fire will permit. In the forests, villages, etc., the reserves remain under cover.

" The positions of the infantry should be so chosen that it may be sufficiently in advance of its own artillery to protect the latter from the fire of the hostile infantry; it should not be exposed during the artillery duel and should not mask the fire of its own artillery.

" The infantry constructs trenches that are either arranged for fire or are merely defensive, for the cover of the sustaining troops or the reserve. In either case quickness of action is necessary, and as far as the circumstances permit, simple head cover should be established as a protection against rifle shots and fragments of shell and shrapnel. Against direct fire the best means of defense consists in the skillful distribution of the cover in places where the attackers will not be able to detect it.

" It may be useful to establish artificial obstacles where the enemy might advance under cover up to the intrenchments. These, however, as far as possible, should not impede the defender's freedom of movement. It is not necessary that the cover for infantry should be of equal strength at all points. In addition to the flanks, other points should be strongly fortified, such as those especially subject to the artillery fire of the enemy or toward which he could advance under cover.

" In the defensive organization of a position it must be borne in mind that its occupation should not be commenced before the enemy has developed the direction of his attack. It will therefore often be necessary to limit the defense at the outset to one by groups (battalions, etc.). These groups of fortifications, at some distance apart, require at the outset but a small number of troops for their occupation. Afterwards, suitably reinforced they may serve also as *points d'appui* during the phases of the battle

and may still be held after the enemy has broken through the lines that joined them. Such constructions are especially adapted to those forms of terrain which, while affording a clear field of fire in front and on the flanks, give cover to the troops temporarily held in rear, thus enabling them to act with the greatest efficiency; when possible, villages, large enclosures, woods, etc., should always be utilized for this purpose.

"The best means of defending such points consists in the skilful disposition of the intrenchments (retiring the flanks or resting them on a declivity, etc.), and in increasing the number of simply defensive trenches for the supports and reserves. Abundant head cover should protect, as far as possible, the garrison from the effects of artillery fire. Artificial obstacles should serve to detain the enemy within the zone of fire. When practicable the firing should be directed by sectors.

"The employment of the closed redoubt is *exceptional* in field fortification.

"In selecting artillery positions not only should a clear field of fire be considered, but its front should be approximately normal to the principal direction of the fire, the pieces should be on level ground, sufficient space should be allowed inside the battery and the battery must be available for short as well as long ranges. Time and circumstances permitting, hasty cover should be thrown up, to be strengthened later, and head cover provided for the cannoneers, as already noted above for the infantry.

"If heavy artillery be available it is to be especially employed against the opposing artillery, against troops under cover or directed against its principal lines of approach, according to its calibre. The probable position of the hostile artillery will serve as a guide in its emplacement. On the flanks, also, fortress artillery will be advantageous, obliging the enemy to make long detours. For such batteries good roads in rear will be necessary, especially for facilitating the service of the ammunition.

"When the position is intersected by impracticable zones or when there are difficult roads or obstacles in its rear, care must be given to the improvement and widening of the roads, the marking out of the routes to be followed by the columns, and to the crossing of ditches and streams of water, etc. Guides should be used also, and at night, lanterns should be provided to facilitate the movement of the troops held in the rear when called forward for action.

"Telegraphic and optical signal communication should be established between the different parts of the line.

"Field works in siege operations partake at first of the same simple forms adapted to field warfare, but should be begun in such manner as to permit of their subsequent development and strengthening.

"In siege operations the danger of surprise is great on account of the close proximity of the enemy. Besides, the lines should be occupied for long periods with a minimum force, in order to give needed rest to the sustaining troops. Therefore many obstacles should be established in front, especially at those points where a counter-attack is not intended. It is necessary besides to provide liberally for the protection of the troops against artillery fire and inclement weather. Finally, it may be desirable to com-

bine in a single zone groups of fortifications on the position occupied, in order to increase as much as possible their power of resistance. Redoubts, if exposed to the fire of artillery, are to be avoided. Great importance should be given to every measure tending to facilitate the transmission of messages or the practicability of the roads connecting the different parts of the defended position.

"Sometimes it will be necessary to secure the possession of single points, such as storehouses, tunnels and bridges with the smallest possible number of troops. In such cases surprises on the part of the attack are easy, although the systematic use of his artillery fire would be difficult. Closed works surrounded by obstacles may then be useful."

It is certainly not possible to comprise in a briefer space so many golden maxims, solving the principal questions of field fortifications, while leaving to the troops such liberty of action as to enable them to meet each particular case. These rules merit the attention of all students of the art of fortification, all the more that the principles are contrary to those which we generally find in modern treatises and which are in favor with noted writers.

First of all we refer to the occupation of advanced posts, which the instructions practically forbid, giving preference to the fortification of a single line strongly. The French, on the other hand, attach great importance to such advanced posts; "to hinder the observations of the enemy, threaten the columns that attempt to pass beyond them, to attain troops of the attack held on reverse slopes, to occupy controlling points and to more easily command the neighboring lines of communication and water-courses." So with us, the "General rules for the employment of the three arms in combat" permit the occupation of advanced posts, but we are warned on no account to be drawn into reinforcing them, "to avoid being drawn into battle, not on the prepared position, but on a more advanced one, which not being chosen beforehand is more difficult for the defense to hold."

Major Speccamela in his valuable work on improvised fortifications says that the occupation of advanced posts "arises from tactical and strategical necessities," and seeks by historical examples to show that their advantages outweigh their inconveniences. We prefer to leave to the decision of future battle-fields the correctness of the German idea that advanced posts "conduce readily to the defeat of troops occupying them and mask the fire of the principal positions."

As to the reinforcement of defensive positions, the German manual cautions that villages, large houses, forests, etc., as well as redoubts, are not adapted for this purpose, and so in this respect opposes directly the principles generally admitted up to the present time. The reason for this is to be found in the great importance which the Germans justly attach to the increased power of modern small-arms, and to projectiles charged with high explosives, fired from field guns and field mortars, against which neither these designated points nor works of high relief can avail as a protection, as in the past. According to the modern German idea field fortification depends for its power on the open field of fire, in concealing as far as possible the works from the view of the enemy, in lowering as much as

possible the relief of the covering masses, giving them at all points a uniform appearance, similar to that of the neighboring ground, and in the liberal use of simple and complex head cover.

The French instructions indicate a predilection for the "work of the company" whose rôle is to strengthen an isolated position or an important point of the line of defense. They prescribe a relief of 1.30 m. with two faces of 30 m., two of 15 to 20 m. and two additions in the gorge of the same length. They do not mention head cover, however, and it is not apparent how the men are to be protected against artillery fire by merely remaining behind the parapet. Captain de Guise also would retain the redoubt as a *point d'appui* of the defensive line and would assign a relief of from .80 m. to 1.30 m., providing it with bomb-proofs to protect the men from the effects of direct fire and high explosive shells. It may be observed, however, that such works cannot be constructed by the infantry alone, and besides, on the field of battle it is not always possible to find at hand the necessary materials and the engineer troops to prepare them. The earth, and fragments of dynamite shells exploding within the redoubt would be dangerous to the troops sheltered against the parapet. It would not seem, therefore, that this solution of the problem is a happy one.

Also our own general instructions for the employment of the three arms in combat say: "Whenever possible it is advisable to erect on the position redoubts to serve as *points d'appui* for the defense."

Speccamela after pointing out that such points, if not afforded by the natural features of the terrain, should be constructed, devotes an entire chapter of his work to the consideration of the subject. But for the Germans the redoubt no longer meets the exigencies of to-day, and it is to be employed only in isolated cases, to defend storehouses, bridge-heads, entrances to tunnels, or to protect the gorge of a permanent fort. And so the redoubt after a long and glorious career, disappears now from the field of battle, at least for the German army.

Also in the defense of positions the principle established by the Germans, is contrary to that generally admitted in France and Italy, that is, that the principal defense should be made on the perimeter, especially in the case of woods. These instructions direct, on the contrary, the establishment of the intrenchments as far as possible in advance, because the view of the enemy is thus impeded, his attention being naturally drawn to the salient features, thus overlooking the occupied position; the distance to the former is readily learned, also, from a good map. A certain liberty of action is nevertheless allowed the troops, the first essential being an unimpeded field of fire, and if this cannot be secured in the advanced position it is allowable to intrench on the perimeter.

In the second part of the instructions we find, as above stated, the rules for the construction of the field work, beginning with the clearing of the field of fire. To clear the field up to 1000 metres range, is the most favorable condition for the victory of the infantry; but if there are fields of grain in front of the position the commander is to limit himself to clearing it up to 500 metres only, using for this purpose the infantry rather than the cavalry. It is of importance to destroy such objects, (trees, mills, etc.), as may

betray the defender's position to the enemy. The clearing of the field of fire proceeds *pari passu* with the other defensive arrangements.

Then follow the profiles which are indicated as guides in the construction of the defenses, but are not rigidly imposed. That for the man lying down is abolished. For the man kneeling the total relief is .90 m. with a relief above the level ground of .40 m. (Fig. 1.)



FIG. 1.

For men standing the total relief is 1.40 m. with .60 m. above the level. (Fig. 2.)

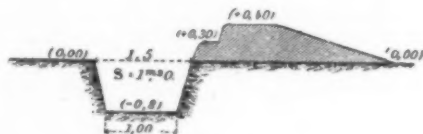


FIG. 2.

The normal profile is that of Fig. 2. If time permits, or if the necessity arises to reinforce the line, the ditch is widened in rear, leaving in front a step at a depth of 1.40 m. below the crest. (Fig. 3.)

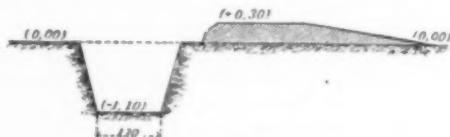


FIG. 3.

If a still lower covering mass is desired, the type indicated in Fig. 4 may be adopted, its ditch permitting communication under cover behind the men firing.

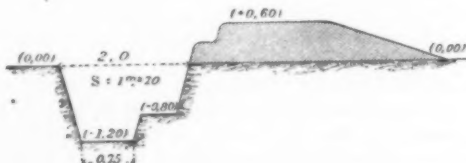


FIG. 4.

In case of prolonged occupation the trenches may be developed as indicated in the profiles of Figures 5 and 6, with a total relief of 2.20 m.



FIG. 5.

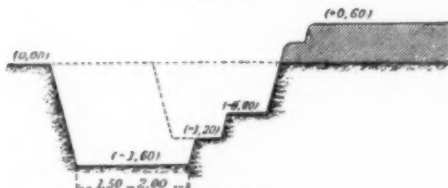


FIG. 6.

The principles of construction are the same for all the trenches. The soldier should be able to load and fire with facility and the small upper step is therefore to rest the arms in firing and to hold the ammunition. The parapets are relatively thick and low, unless a much covered terrain demands a higher altitude. The Germans prefer to deepen the ditch and keep the covering masses low. The minimum thickness of parapet varies from .75 m. in sandy soil, to 1 m. in cultivated ground, these thicknesses being great enough to resist bullets and the balls from shrapnel. The parapets are not to be advised as it is a source of danger when torpedo shells fall within the works.

The merely defensive trenches differ from the preceding only in that they are not arranged for fire, and have the total altitude necessary to cover a man standing. At the extremities are constructed easy ramps or steps to permit of the ready sortie of the sustaining or reserve troops, unless covered passages are constructed to connect them with the front line.

Sharp angles are to be avoided, and the parapets should be so covered as not to appear dissimilar to the surrounding ground. Imitation trenches and dummies suitably disposed will render it more difficult for the enemy to determine the true position. Those portions exposed to enfilading fire should be protected by suitable traverses; to this end, as soon as the excavations are begun, masses of earth 3 or 4 metres thick are left at the proper points and the ditch is dug around them, and the traverse given the necessary elevation. If the time is limited and the ground permits, parallel trenches may be used, but only in exceptional cases.

Then follow the rules for the construction of head cover. From the number of forms selected, as well as their simplicity, this part of the instruction seems of great importance and it is reproduced entire.

(To be continued.)

Military Notes.

MACHINE GUNS WITH CAVALRY.

CAPT. W. ANSTRUTHER THOMSON, Royal Horse Guards, read a paper on the above subject at the Royal United Service Institution. The lecturer said: It has sometimes been suggested that machine-guns should form part of a battery of artillery, but this idea has wisely been ignored, for although they might sometimes be so employed, especially as a safe-guard against cavalry attack, the true rôle of the machine-gun is in independent action. The value of a machine-gun for purposes of defense is generally admitted among nations, but, as our cavalry drill book so ably points out, these weapons can do far more than this, and there is now no doubt that, in taking part in a vigorous offense, reliable machine-guns will prove invaluable. Let them push forward with the first line, if possible, wherever they may find cover, and dash out, as opportunity occurs, and take the enemy by surprise. A hedge, a hayrick, a cottage, a clump of trees, or even a heap of stones, will often furnish a hiding place for the occasion. The gun presents so small a target, it is so easily concealed, it is so quick, so mobile, and so deadly, that when properly handled it should rarely be captured or put out of action. Now and again, no doubt, one will be lost, but these dogs bite, and men and horses will think twice before attacking them, except under the most favorable circumstances; and if they serve their purpose it may pay to sacrifice them. It is easy to render them useless to the enemy; to carry away or hide the lock, to jamb the bore, or to knock off the sight, would be the work of a moment. It is even possible to unhitch the gun itself and carry it off in one's arms for a few hundred yards, or otherwise disable it; but a clean pair of heels will generally obviate that necessity. Except when it is desirable to hide it, the cavalry machine-gun is no use galloping behind the centre squadron of a regiment; it should be away on the flank, where it can best get a chance of manœuvring with effect; it is only in the way as a serrefile. The gun commander must keep his eyes open, he must watch the enemy, and watch the ground, and watch his own force too. He must keep his line of retreat secure, if possible, and not allow himself to be taken in flank, or rear, or get too far away from succor. He must choose his position well, and decide quick and travel quick, for it is one thing to select a position, and quite another thing to get there. He must ever be pushing on, taking every short cut and advantage possible. He must always be "there," but never in the way. Cavalry machine-guns should seize every chance not only against cavalry but against the other arms, especially artillery; to creep along a hedge, to get within range without exposure, to fire at guns, horses, and escort, at about 1000 yards, will be a right task for a single gun, and if war has any likeness to manœuvres

such golden opportunities will constantly recur. There would be no waiting for an umpire then, and few would be the arguments urged against the machine-gun when it had played for half a minute at a fair target within that range. At the same time it must be remembered that one well-directed shell will demolish the machine-gun, and it is only where sufficient cover is forthcoming that this can safely be done. To illustrate the subject, I will now ask you to follow a machine-gun through the Idstone Manœuvres of 1893, showing the opportunities that may arise for such a weapon with cavalry in the field.

Having described the work done by the machine-gun of the Blues, of which he was in charge at the last autumn manœuvres, Captain Anstruther Thomson went on to give his ideas as to the best means of managing the guns.

Having followed the gun in manœuvres and in action, let us turn our attention to the vexed questions of matériel and personnel, upon which such varied opinions are held. From experience at the above manœuvres and elsewhere I am led to certain conclusions which I will, with all due deference, put before you.

Transport of the Gun.—In the paper read by Captain Benson, Royal Artillery, in November, 1887, and in that read at Aldershot, by Capt. Stone, Royal Artillery, in July, 1888, and in the discussions which followed, this subject was well threshed out; but, although five years have elapsed since then, very little has been practically done towards the solution of the question, which I maintain can only be solved by practice in the field. Personally I would like to see experiments tried with a four-wheeled buggy on hickory wheels, somewhat of the buckboard type. I should mount the gun with a small shield to protect the firer close to the rear axle, so that it could be fired with the least possible vibration, with the horses in, if necessary, though they should be taken out whenever it is safe to do so; but in cavalry work this can seldom be done, for though it takes but a few seconds to take them out or put them in, it is the seconds that make all the difference. While on this subject I would like to point out a carriage designed by the Maxim Nordenfeldt Company for a 3-lb Q. F. gun. The horses to be driven three abreast like the Russian troika. I cannot here enter the question of quick-firing guns with cavalry, it is beyond the sphere of this lecture, but I think that I may safely say that these are the weapons most to be dreaded by machine guns on service. I have here two cartridges—common shell and shrapnel—designed for the 3-lb., and carrying 36 bullets, but I think a larger calibre, such as a 6-lb, would be far preferable. But to return to our subject, I must say that from personal experience I have great respect for a cart of the buckboard type, having been taken over places in them in the Australian bush that I had deemed quite impassable; and I expect that there are many officers here who, having travelled in America and Australia and elsewhere, know how much can be done over rough country, in a four-wheeled buggy heavily laden, and not always with the best broken horses. At the same time it must be remembered that wheels will not go everywhere, and I am strongly in favor of having a pack saddle and tripod handy in case of need. The Cape Mounted Rifles have adopted this suggestion, and a pack saddle is to accompany every Maxim. The

saddle they have adopted is Capt. Newburgh Stewart's, which is fashioned with a hinged tree, somewhat on a similar principle to the Austrian saddle, which has come as a blessing to cavalry, and was introduced into this country by Gen. Keith Fraser. Another saddle which appears to me well suited to the purpose is that invented by Gen. Bogle; it has the great advantage of counteracting the dead weight of the load by means of a kind of cradle and four springs, the weight being distributed over the whole of the horse's back, instead of having all the pressure on the top. I have seen a horse with Gardiner gun tripod and 300 rounds of ammunition jump four feet high in this saddle, and it takes but ten seconds to come into action, and about 20 to replace the gun in the saddle. It is adapted for carrying ammunition and other baggage as well. Through the courtesy of the above-named gentlemen, both these saddles are here for your inspection. At least one ammunition horse would, of course, accompany every pack saddle gun with a load of 2000 rounds. Light intrenching tools should always be carried with the gun, whether on horseback or on wheels; a few strokes with axe or spade will often enable the carriage to cross an obstacle that otherwise would be impassible, and a hasty intrenchment might sometimes be of use. As regards harness, I believe that we might get some useful hints from the fire brigades of different countries, but the harness invented by Major Baden-Powell, and adopted by the government, enables the horses to be taken out or put into the carriage in 10 seconds, and this will be hard to beat.

It is laid down that the Maxim gun should carry 3500 rounds, H. M. bore, on the carriage, and 7200 in the ammunition cart; the whole amount should, of course be carried on belts. While the Nordenfeldt carries 2000 in boxes, the introduction of the 0.303 bore will enable us to carry about half as much again. While pack-horses can carry 2000 apiece. With machine-guns it is of the utmost moment that reserve ammunition should be forthcoming when required. The expenditure is so enormous and so rapid that unless fresh supplies are at hand the guns may find themselves out of action at the very time when they are most required. The amount of ammunition to be expended during the fight is a matter for careful judgment and anxious thought. It can only be solved in the field; and no amount of theory will avail unless the gun commander can keep his wits about him and his reserve ammunition at hand. Smokeless powder, so long as it is satisfactory and does not destroy the barrel, is all in favor of machine guns. We will see our target without being blinded by smoke or our position being revealed by that cause.

This is a most important subject, and one to be thoroughly considered. At 1000 yards it is possible to put nearly every shot on a 12-foot target. At 1800 yards two Maxims did good service in Mashonaland, and proved itself effective beyond that range. At distances within 1000 yards, in the hands of expert and steady marksmen, it is deadly. Of course, at long ranges, it will be a question whether the execution done will pay for ammunition spent. Experiments have been made firing at a particular spot from the reverse slope of a hill. A couple of pegs in line on the brow, and a man with a telescope to signal the result of shots, being all that is necessary to carry this

out in a rough and ready fashion. A bridge or defile where the ground was favorable might be held by an unseen gun in this manner. A range-finder should always be carried with the gun. The Mekometre, though requiring two observers I believe, can determine ranges with only 5 yards error up to 3000 yards.

I advocate the introduction of orthoptic sights such as have been adopted by Major East, 1st V. B. Hants Regiment, made by Messrs. Rigby, I believe, and proving most satisfactory. Telescopic sights might also be carried with advantage.

The shield should be as light as possible but big enough to cover the firer and strong enough to withstand the heaviest small-arm bullet. A shield of $\frac{1}{4}$ -in. thickness will answer this purpose. There is no doubt that the average man will shoot better when he is safe or thinks that he is safe, than when exposed, and a gun with a shield could do a lot of work under fire where an unprotected gun could not live. Against this, of course, comes the question of weight, and whether the advantage of a shield compensates for the extra strain on the horses. Myself, I think it does. The officers who worked the Maxim in Mashonaland are all in favor of shields.

Many are in favor of forming machine gun detachments into separate units. How far this might answer I cannot say, but at present the regimental system is far more likely to be adopted because it is the most economical. It is very improbable that money will be diverted from other military objects to establish machine gun batteries or troops. For the present, then, I confine myself to the regimental system, which I think can work very well. I should like to see three or four machine guns at least to each cavalry brigade. An officer, a sergeant, and two men to each gun. An experienced non-commissioned officer and two men with the spare ammunition, which should be carried in a similar manner to the gun. Scouts should be permanently told off, both for the gun and spare ammunition. When several guns accompany a brigade, an officer should be told off in charge of them, lest they should all be on one flank in each other's way, but a wide latitude as to movements and position must always be conceded to individual gun commanders.

And now we come to a subject that has not been touched upon, so far as I can learn, in previous discussions. I refer to scouts. As with cavalry, so with machine guns, the great chance of success is in surprise, and the chief risk of failure lies in being surprised. It is therefore of the utmost importance to have good scouts, four at least for each gun and two for each ammunition cart. Cavalry leaders are naturally adverse to weakening their squadrons, but I ask you, is it not worth while to take a man out of the rear rank of each squadron, rather than to cripple the whole offensive advantage of a weapon which, if properly handled, may decimate a whole brigade. Though it would be folly to gallop blindly forward in an unknown country without scouts, for ground or enemy, it is by pushing forward, not foolishly but boldly, that the gun will make its name.

Except under certain conditions an escort is a great advantage. It makes a man bold; the knowledge that it will follow and look after the detachment takes away half the anxiety of the machine gun commander.

Without an [escort he] has to be ever looking round. Where is the main body? What is their object? How can we get there? Shall we be in the way? are questions that constantly crop up, and though, of course, they must be borne in mind, they should not be allowed to bar the road to enterprise, and a field troop, as escort, would solve the question. Again, the presence of a troop will tend to keep the enemy's cavalry from scattering, and so offer a better target to the gun, this would also apply to infantry, besides preventing the risk of capture from single horsemen galloping in from opposite directions. On occasions, when the escort is not required, it could rejoin its squadron.

In conclusion, he said: "In all the above suggestions I would ask you to bear in mind that I claim nothing for theory; practice and experience are alone the true and proper tests, and unless experiments are made all argument is in vain. To sum up the whole matter, whether the gun is carried on horseback or on wheels, whether the detachments belong to regiments or are a unit of themselves, the same tactics will apply, and rapidity of movement is a great desideratum. Tell the gun commander the general idea, give him as free a hand as possible, and I predict that these guns, so far from being an impediment, will be a welcome aid to cavalry. They are suitable alike for attack and defense, a useful auxiliary to every arm, and will prove themselves of value hitherto undreamt of. As the improvement in modern fire-arms continues, so increases the importance of supporting our cavalry with fire. Here is a chance of carrying, so to speak, a battalion in our pocket. We have proved that it can travel, we know that it can shoot. It is but a few weeks ago that it saved a British column from defeat. One of the enemy has described its effect. In his own words he says, 'It mowed us down.' What is there to prevent these ominous words from being applied to the battles of the future?"—*Army and Navy Gazette*.

A NEW AMMUNITION CART.

A new ammunition cart has been designed by General Engelhart and adopted for the Russian infantry. The wagon without load weighs 287 kilog. It carries a wooden chest holding 14,400 cartridges which, at 23.5 g. per round, represent a weight of 338 kilog. If the cartridges are carried in tin plate boxes, the wagon with load (including about 33 pounds of forage) reaches a weight of 770 kilog. This new wagon has two wheels and is drawn by two horses; it has been decided to hitch them with pole and cross-bar. The horses are driven à la Daumont as with the other artillery carriages. Preparations are also being made to construct an ammunition chest for the artillery consisting almost entirely of aluminum, which metal, if used in the construction of the ammunition cart, would diminish its weight, increase its mobility and tend to spare the horses.—*Militär Wochenblatt*. C. R.

STRENGTH OF THE FRENCH ARMY, 1893.

At the end of the year 1893 the active army of France consisted of :
 584 infantry, etc., battalions with 2404 companies.
 89 cavalry regiments with 446 squadrons.
 480 light, horse and mountain batteries.

100 foot (garrison) artillery batteries.
22 engineer and railroad battalions with 88 companies and 5 companies of drivers.

28 companies of pontoniers in 2 regiments.

72 train companies in 20 squadrons.

The reserve troops consist of:

145 infantry regiments and a number (as yet unknown) of chasseur battalions, probably about 30.

38 reserve cavalry regiments.

216 light batteries.

The territorial army consists of:

458 battalions and 145 depot companies, including 13 chasseur battalions.

78 squadrons.

229 batteries of field and garrison artillery.

18 engineer battalions.

19 train squadrons.

After recent changes of stations the troops in the 6th district (German frontier) consist of:

77 battalions.

13 chasseur battalions.

110 squadrons.

48 field batteries, including 11 horse batteries.

31 foot batteries.

1 battalion of engineers.

1 train squadron.

The appropriation bill for 1893 provided for 28,135 officers and 518,796 men, that for 1894 for 28,339 officers and 532,631 men.

The war strength of the army for 1892 is given as 4,372,000 men by *L'armée militaire et maritime pour 1892* and by Captain Molard as 4,350,000 men.

The appropriation bill for 1894 amounts to 1505 millions of francs as follows:

For the army, 634 millions; navy, 267 millions; interest on debt contracted for reconstructing the war material, 439 millions; pensions, etc. 165 millions.

In the Italian army the following officers have been authorized to wear civilian garb after 3 P. M.: All general officers, colonels commanding brigades, commanders of military schools, commanders of field and fortress artillery in two corps districts, the directors of engineers.—*Militär Wochenblatt*.
C. R.

PHYSICAL DEVELOPMENT OF THE CHEST.

At the Royal United Service Institution an able and interesting lecture was delivered on "The Art of Breathing as Applied to Physical Development," by Surgeon-Captain A. L. Hoper Dixon, A. M. S.

After briefly demonstrating, from an elementary point of view, the anatomical and physiological aspects of the parts concerned, the lecturer proceeded to show how breathing, properly applied, may effect the physical development of the chest. The chest may be increased in three diameters

—namely, from above downwards, from before backwards, and sideways. Correct and incorrect methods of taking one's breath may be easily observed from the exterior. (1) Upper chest or collar-bone and shoulder breathing, (2) mid-chest or rib breathing, and (3) abdominal or diaphragmatic breathing. These movements are to some extent dependent on each other.

The incorrect mode of breathing consists in filling the upper and middle portions of the lungs with air partially at the expense of the lower. The collar-bone and shoulders are raised, so also are the upper chest and top of the breast-bone; there is a slight movement upwards and outwards of the ribs, whilst the lower portion of the lungs remains passive. The diaphragm is only exercised to a feeble extent, and the abdomen, released from diaphragmatic pressure, shows a concave surface instead of convex. This mode of breathing is practised by the majority of people, both male and female, and is entirely wrong.

The recruit has not the slightest notion of filling his lungs. He is told to take a deep breath and replies by raising his collar-bones and hunching up his shoulders. In other words, he makes an exaggerated effort of his usual mode of breathing. The result is that his chest expansion must be very small. Recruits frequently have less than one inch chest expansion, and some only half an inch. A medical officer at Aldershot found that out of 1500 recruits, the chest measurements in 95 per cent. did not exceed $1\frac{1}{2}$ inch between the maximum and minimum measurements. This is the average from his recruiting book.

The second mode of breathing—mid-chest or rib—consists in the expansion of the middle and lower portions of the chest, principally in the transverse and antero posterior diameters, which is accomplished through the medium of the ribs. The latter are drawn forwards, outwards, and slightly upwards, and the breast-bone is pushed forwards. This mode of breathing does not stand out separately by itself as an independent act, but coexists either with the incorrect method of upper chest breathing or the correct style of abdominal or diaphragmatic breathing.

The third and last method of breathing is the abdominal or diaphragmatic. In this act the lungs are filled with air throughout, but not necessarily overcrowded. This is the correct form of breathing, and is assisted by the ribs. Directly we take a deep breath the diaphragm descends and flattens out at the sides, so pressing down the abdominal organs below; and, as a consequence of this, the exterior surface of the abdomen naturally assumes a round convex appearance. Then, when expiration occurs, the pressure on the abdomen is released, and its surface loses its roundness of outline as the result of the diaphragm flying back to its original position. It is a common occurrence to see people take an inspiration, hunch their shoulders up, draw in their abdomen, and then expire and puff their belly out, and they are under the impression that they are breathing correctly, whereas it is the exact opposite that should take place. In correct breathing there should be no movement of the collar-bones or shoulders, but merely a forward and upward movement of the breast-bone, more especially the lower part, combined with the rib movement already described and the alternate enlargement and diminution of the abdominal walls.

A practical demonstration was given of the means he employs for developing the chest and otherwise strengthening the body, with the aid of three recruits of the Medical Staff Corps, who have been permitted by their commanding officer to take advantage of a short course of breathing drill.

Surgeon-Captain Dixon explained that he found with his pupils that a slight pressure evenly distributed over the diaphragmatic area facilitates not only the method of explanation but also the practical results, and exhibited a shield which he recently designed for this purpose. The diaphragm is quite as easy to train, with proper care, as any other muscle in the body; but, strange to say, owing probably to its being out of sight, it is entirely neglected. In weakly subjects with poor breathing capacity and delicate lungs exercise may, with judicious practice, be the means of establishing a robust condition of health. So far as stammering is concerned, and when not due to any exciting cause, which may be removed by surgical or medical treatment, these exercises may be the means of effecting a speedy and permanent cure. A recruit who stammered so badly that it was apparently a hopeless case, at the end of three months he was practically cured, and had no difficulty either as "challenging" when a sentry or "numbering off" on parade. The reason men are rejected for the army, so far as chest measurement is concerned, is because they neither know how to fill their lungs with air on the one hand, nor empty them on the other. Given any recruit who is healthy, but still does not come up to the required standard of chest measurement, the lecturer guaranteed that in a few weeks, by means of his diaphragmatic drill, he would expand the man's chest to the necessary requirements. The younger the man the more satisfactory the results.

So far as his own experiences are concerned, Surgeon-Captain Dixon commenced practising these exercises about ten years ago. At that time his chest expansion was $2\frac{1}{2}$ inches, but on his subsequently employing the form of breathing advocated his chest gained corresponding strides in development, and at the present he has 6 inches expansion between his minimum and maximum; this measurement being accorded him a short time ago, by two officers at Aldershot, on the occasion of his giving a brief demonstration on the subject at the military gymnasium. With reference to the recruit, the lecturer recommended a course of these exercises at the time of undergoing gymnastic training.—*United Service Gazette*.

NORWEGIAN COOKING STOVE.

During the last manœuvres in Russia experiments were made with the Norwegian cooking stove, the object being to provide the troops on the march, within the least possible space of time, with warm food. The apparatus used was the ordinary camp kettle fitted into a thick felt covering. The soup or stew being placed in the kettle is raised to the boiling point, and then removed from the fire, the lid clamped down, the kettle inserted in the sheath, and the whole slung in the usual manner below the wagon. The process of stewing continues automatically, thanks to the heat retained, and even after several hours' marching the temperature does not fall below 100° Fahr.—*Journal R. U. S. I.*

WAR STRENGTH OF DUAL AND TRIPLE ALLIANCES.

	Officers and Men.	Horses.	Guns.
Dual Alliance, Peace strength, Russia.....	1,033,661	150,000	2,200
France	538,738	122,000	2,810
Total	1,572,399	272,000	5,010
Triple Alliance, Peace strength, Germany.	593,550	120,000	2,964
Austria ..	319,235	65,500	1,000
Italy	238,000	52,000	860
Total	1,150,785	237,500	4,824
Dual Alliance, War strength, Russia.....	2,411,105	463,000	5,200
France	2,715,600	800,000	4,500
Total	5,126,705	1,263,000	9,700
Triple Alliance, War strength, Germany ...	2,440,000	562,150	4,430
Austria	1,590,000	292,000	2,140
Italy	1,253,200	134,000	1,620
Total	5,283,200	988,150	8,190
Total forces available by both alliances in war, field troops only.....	10,409,905	2,251,150	17,890
Gross population of both alliances.....	272,569,462		

—Archibald Forbes, *North American Review*.

HOW TO MAKE A TELEPHONE.

The following description and cuts of a telephone very simple to make we borrow from *The Electrical World*, which states that it will give excellent results on lines up to five or ten miles in length, when used both as a receiver and transmitter. If used in connection with a transmitter, it will answer for any length of line. If the line is to be constructed in close proximity to electric railway or light wires, it should be made a metallic circuit, but elsewhere a grounded circuit will answer just as well.

The material required for a set consisting of two telephones, one for each end of the line, is as follows: One ounce No. 36 silk covered magnet wire; two horseshoe magnets, 4-inch; two flat-head stove bolts, one-quarter inch diameter and one and one-half to two inches long; a piece of photographer's tintype large enough to cut from it two round diaphragms two and one-half inches in diameter; four small wood screw binding posts; twelve flat-head brass screws three-quarters of an inch long. Use well seasoned mahogany, or any hard wood, about seven-eighths to one inch thick for the main case and for the cover that one-quarter or three-eighths inch in thickness is best. The pieces of wood should be larger than the dimensions

given, and if marked and bored before sawing to the size desired, there will be less likelihood of splitting.

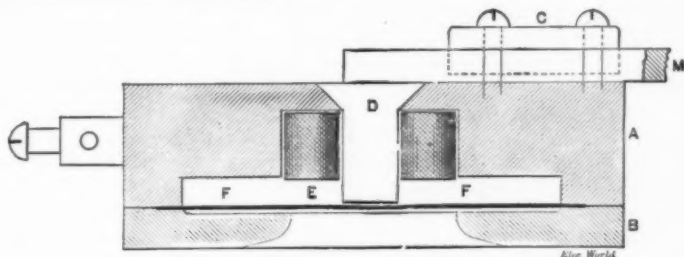


FIG. 1.—SECTION OF TELEPHONE, FULL SIZE.

Fig. 1 is drawn full size, from which the dimensions for the holes in the wood can be obtained. The two and one-quarter inch space under the diaphragm, F, can be bored with an extension bit or marked out with a compass and cut out with a chisel. The inch hole should be bored with a bit which has no lip in order to leave strength sufficient for countersinking the head of the stove bolts. The depression in the lid need not be as deep as shown, but merely enough to clear the diaphragm. The stove bolt should be cut to a length a little longer than necessary and then carefully filed and fitted by trial so that when in place it will just clear the diaphragm.

For the wire a spool should be made of cardboard to fit the bolt and central hole neatly; the spool with wire, E, is wrongly shaded in the cut.

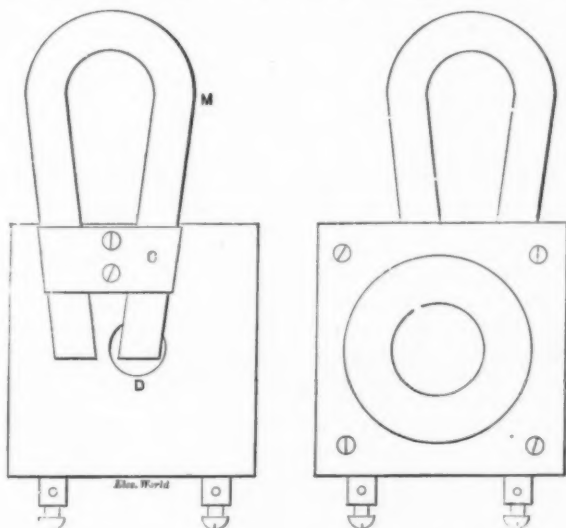


FIG. 2.—REAR AND FRONT VIEWS OF TELEPHONE, HALF SIZE.

The magnet is held in place, with one pole over the bolt head, by a piece of wood, as shown in Fig. 2 (half-size), the part between the legs of the magnet just clearing the bottom when the screws are home. The ends of the wire are brought to the binding posts through two small holes bored in the wood. Magneto bells are the best and, in the end, the cheapest for use as call bells in connection with the telephone.—*The Electrical World, N. Y.*

RÉGLEMENT SUR LE SERVICE DE SANTÉ, FRANCE.

Not the least remarkable evidence of the great progress made by the French in the organization of their army is to be found in the official treatise, "Réglement sur le Service de Santé de l'Armée en Campagne." These regulations are marked by a thoroughness and attention to detail which, if carried into effect in war-time, will result in the complete efficiency of their hospital service, and a corresponding diminution of suffering to the sick and wounded. The tactical employment of the ambulance service is most carefully treated, and what is remarkable is the provision made for its presence with the most advanced troops. Movable field hospitals are pushed well to the front, and it is noticeable that those most favored for this work are of English origin, being the "tortoise" field hospitals, which from their extreme mobility are specially suitable for such work. In other armies it is usual to keep the hospitals more in the rear. This marked contrast between different systems would point to the need for a more uniform regulation of this organization, which is worthy of the careful study of those interested in and responsible for its humane operations.—*Broad Arrow.*

IMPROVISED v. ORGANIZED ARMIES.

A lecture on the above subject was delivered, under the auspices of the Military Society of Ireland, at the Royal University Buildings, Dublin, on the 20th inst. by Lieut. T. M. Maguire, M. A., LL. D.

The lecturer having dealt with and explained the manner in which the Germans entered France in 1870, and explained and illustrated the lines of march by means of a series of elaborate maps, said the preliminary movements and the engagements of the war were miraculous, for in 17 days all the regular troops of a great military nation, long accustomed to hold a position of preëminence in the art of war, had been scattered to the winds. One of its distinguished marshals, with five corps and the Imperial Guard, was shut up in a fortress and laid under siege. When Metz was invested the Germans reorganized their formation, and by the middle of August in that year Strasburg was also invested. The Germans passed on to Paris, and it was besieged on the 19th. In this crisis it was to the everlasting credit of the French people that they did not despair. The populace of France, which was supposed to be the most frivolous in the world, became the most enthusiastic. Men, women, and children were ready to sacrifice all to save the honor of France. The incidents of the siege of Paris by 150,000 Germans, ultimately increased to 250,000, were simply of a most marvellous character. The new government of France saw that a mistake had been made by the old government in confining the defense of France to only a small section of the country. One of the chiefs of the new government—

a great orator, and a man of heroic sacrifice, great courage and energy, and capable of transferring to others his patriotic enthusiasm—arose, Gambetta was that great man. He left Paris in a balloon, the only means available at the time, but instead of being wafted to Loire, where he wanted to go, the wind brought him over Metz, where the Germans, who were in strong force opened a vigorous fusilade upon him. He was wounded, but he continued in the air until at last a favorable wind brought him to Tours. Then Gambetta began the most famous irregular proceedings in the history of the world. He raised a new army between the end of October and the end of November, and tapping the fighting capacities of the nation, bore down on Paris. It was just possible that the government would have to raise the siege, but the reserves from Metz and the new army were crushed not because they lacked courage, but because they were untrained, and unable to cope with the splendid German organization, for a carman or a shopman could not be made an artilleryman in a week and sent to do battle against disciplined men. Hastily organized irregular troops were in modern times, however enthusiastic and courageous, practically useless against regular trained soldiers. In the Franco-German War they saw a celebrated army, fighting under celebrated chiefs, overwhelmed and destroyed; they saw heroic and desperate efforts, unlimited expenditure, terrible waste of life, undertaken with the object of retrieving the destinies of the country, all defeated. What lesson did they draw from that? From the fall of France in 1870 each European nation could see its fate, and should not neglect to build up a good military organization, despite the speeches of philanthropists and the theories of humanitarians. No nation ever grew powerful and retained its power except by carefully preserving and cultivating and encouraging the study of arms.—*The Army and Navy Gazette.*

Reviews and Exchanges.

Great Commanders—General Scott.*

ALTHOUGH it is 28 years since General Scott's death, and nearly 33 since his retirement from active service, it is doubtful if the time has yet come when his life can be reviewed with that honest impartiality, without which any such undertaking must be valueless. History should never be written until at least a hundred years after the events with which it deals. General Scott, like every other prominent man, had his admirers and his detractors during his lifetime; and they are not all dead yet. Any true representation of him therefore, either as a man or a commander, is apt to be unsatisfactory to both parties. To the one it will appear too laudatory; to the other not laudatory enough. To be sure the mass of the people now may be said to belong to another generation; but the old leaven is still active, and the mass must be more or less affected thereby. A study of the life of any man, especially of such a prominent man as General Scott, is, or ought to be, something more than a mere recital of his achievements. We want to see the soul of him. What he did is already well known. What he was is the problem to be solved.

Winfield Scott was the grandson of James Scott, who fought on the losing side at the battle of Culloden, and is alleged to have been a cadet of the house of Buccleugh. So the young Virginian was the descendant of a fighting family, and had inherited a physique which any swashbuckler of the border might have been proud of. He seems to have been amiable in his youth, as all young men of fine physique generally are; but at times, his warlike spirit would flash through his good nature, as it did in Petersburg, when his preceptor was being imposed upon, and then the warrior stood revealed, cool, daring, resolute and confident. His education and training for the legal profession were perhaps the best preparation which he could have had for his future career. Although he became a soldier he never ceased to be a lawyer. He drifted into the army, by no means against his will, although perhaps a little beyond his expectations, and found there a new profession with plenty of room in it for his old one. Nor was he entirely without preparation for his new work. He had, either from natural inclination, or anticipation of the possibilities, given considerable attention to military studies before he had any certainty of a military career, and these studies account in some measure for his early success in his new profession (46). And in his maturer years, when these studies had been mellowed and expanded by experience, they bore fruit in the shape of several valuable military works, which remained standard text-books in the army for many years.

But General Scott, the man of action, was born to the business. He was bound to be a leader wherever Providence might order his lot. His career as a subordinate was short but significant. None readier to obey than he, and none readier to act without orders when occasion required. His life during this part of his career has been much

* *Great Commanders—General Scott.* By General Marcus J. Wright. D. Appleton & Company. New York, 1894.

befogged by the efforts of able editors to paint a hero, as they imagined him to be. If they had confined themselves to plain facts they would have found a real hero, and done the thinking world an obligation.

In small combats and minor operations of war the skill and ability of a leader are to be measured by his discernment and power—discernment of what can and what cannot be done under the circumstances; and power to hold men steadily to their work in moments of supreme danger. Tried by these standards General Scott as a subordinate commander must be pronounced a success. The superiors under whom he acted on the Canadian frontier, do not always seem to have had any well-defined object in view, or, if they did, they surrendered it without much effort. They even, as at Chipewewa, and Lundy's Lane, actually threw away the fruits of victory after the battle was won. The stories told about these battles are so extraordinary, that if they were told us by an adversary they would not be believed. It looks as if the able editor has had something to do with them. But General Scott's rôle stands out clear enough and rational enough in spite of the able editors. Prompt, vigorous, often a little rash, but always successful, he stands revealed a born leader of men. And these experiences were the best training he could have had to fit him for the rôle which destiny had assigned to him. Even the blunders, weaknesses, and indecision of his superiors, were invaluable object lessons to a mind like Scott's, and as incidents in his apprenticeship taught him more than he could have learned in a masterly campaign.

As an incident which helps to bring out the soul picture of the man, his controversy with General Jackson is important; but not otherwise. General Scott acted the manly part throughout, although in the incident which occasioned the controversy he was undoubtedly indiscreet. Whatever a subordinate's opinion may be as to the orders of his superior, he never should discuss them in public. The point to be noted, however, is, that no shadow of resentment remained on the mind of General Scott after the difficulty was settled. Indeed his admiration of "Old Hickory" seemed to be increased (42).

The manliness of his character again blazes out in his controversy in regard to his rights under his brevet commission (43). He honestly believed that his views of the case were correct; he defended them by argument to the best of his great ability; the President decided against him rather harshly, and General Scott reported for duty to the officer who had been thus set over him, promptly and cheerfully, as if no question had ever arisen between them.

In the Black Hawk war his conduct was simply heroic. Bravery in battle is not an uncommon characteristic of our race. Carlyle says, "Any ragged losel * * * if once dressed in a red coat and trained a little, will receive fire cheerfully for the small sum of a shilling *per diem*, and have the soul blown out of him at last with perfect propriety." But courage like that displayed by General Scott in his wrestle with Asiatic cholera among his troops in the Black Hawk campaign is of a higher order and deserves the name of heroism (53).

General Scott's diplomatic ability is admirably illustrated in his management of the nullification embroglio in South Carolina (66). A blunder in that business meant civil war. Nay, the mere announcement, intentional or inadvertent, of the purpose of his presence in the State might have caused an explosion. We have often heard that Scott was a pompous man, profoundly impressed with a sense of his own importance and apt to assert it in season and out of season. But his conduct in South Carolina is inconsistent with such a diagnosis. He there appears to be the discreetest and most modest of men. We are almost prepared to believe that his sprained ankle—too opportune to be accidental—was altogether diplomatic.

The genesis of the Florida war and the war itself are sketched, we think, in an

unnecessarily elaborate way, considering the duration of General Scott's command in that region, and the character of the campaign up to the date of his recall. But the Everglades is a poor field to gather laurels in, and General Scott may have been glad to get out of such a wilderness. That he clearly comprehended the magnitude of the problem is indicated by his report to the War Department that 3000 men were essential to its solution (121). Like Sherman at the outbreak of the Rebellion, he was no doubt looked upon as a lunatic for these views. At any rate he was recalled and investigated by a court of inquiry. Distinguished soldiers ought to be all of the Bagstock breed. Otherwise the ups and downs of the service would make them mad. Scott indeed was complimented by his investigators, but he had been relieved from command all the same, and his calumniator reigned in his stead (122).

What the country lost by this removal of Scott will never be known, but we think it might be approximately measured by the cost of both the Seminole wars. His truth and honesty were better weapons to fight the Indians with than buck and ball. Witness his removal of the Cherokees (130). Not only did he overcome their fixed determination not to leave their old homes; but he so gained their confidence that he was able to dispense with the presence of much of the armed force which the Government had placed at his disposal for the purpose, and to conduct 24,594 Cherokees to their new homes, escorted by only one small regiment of regulars and a company of volunteers, and without shedding one drop of blood (135).

Nor was his influence over the minds of men restricted in its effects to those of savage races. His settlement of the boundary dispute between the governors of Maine and New Brunswick, and also, in the case of the Caroline the critical relations between the Governor of New York and the Canadian authorities; or, to speak more correctly, his removal of these disputes from the field of force to the forum of diplomacy after they had reached the acute stage was a triumph of which Talleyrand himself might have been proud (141).

The character and ability of General Scott therefore were very well known when war was declared to exist with Mexico; but as his political views were not in harmony with those of the administration, and as he was a possible political rival in the approaching race for the presidency, it is not surprising that he was denied the opportunity of increasing his popularity. So the command of the first army sent against Mexico was given to another. But General Scott did not sulk in his tent on this account. On the contrary he was active and energetic in assisting the administration in every way. The war being on, it was necessary that it should be prosecuted with vigor. A second army must be sent into the field, and as General Scott had proposed an acceptable plan of campaign for that army, his assignment to the command could hardly be avoided.

We do not propose to follow General Scott through his brilliant campaign from Vera Cruz to Mexico. Suffice it to say that he carried out his programme to the letter, and established for himself a reputation as one of the great commanders of the century. Nothing but a master mind could have managed a machine such as Scott's army then was with so little friction. No matter how excellent the material may have been, the machine was newly put together and its several parts were comparative strangers to each other. Yet he landed it in boats on an open beach in an incredibly short time, without accident or injury; invested, bombarded and captured the fortress of Vera Cruz inside four days; got out of the fever belt before the sickly season; and fought his way to and captured the City of Mexico against frightful odds and with the consciousness all the time of "a fire in the rear." He was one of the few commanders who could describe the phases of a battle from start to finish, before the battle began. His order No. 111, of April 17, 1847, prescribing the movements in the

battle of Cerro Gordo, which, he says in his report, were "finely executed" on the following day, is an example.

The position of General Scott, even after his great victory of Cerro Gordo, was one of extreme peril. The terms of service of seven regiments was about to expire, and it was expedient to send them away before the yellow fever set in near the coast. There was no prospect of immediate reinforcements. On the contrary, some troops originally intended for his army had been sent to the Rio Grande. Yet no unsoldierly complaints from Scott; no thought of delay in prosecuting the task assigned to him. Instead of that, a cheerful determination to advance. "To throw away the scabbard and advance with the naked blade in hand," as he puts it (194). These are proofs, if proofs were needed, that the man was made of the right metal. Hesitation would have been weakness. Delay would have been dangerous. Complaint would have been ruinous to discipline. There is nothing so demoralizing in an army as a complaining commander.

A European writer has said that the most inexplicable thing about the Mexican War is, that the United States should have abandoned the country after conquering it. And no doubt similar views are held by some Americans. Indeed General Scott must have had at least the possibility of annexation in his mind when he wrote that address to the Mexican people immediately after the battle of Cerro Gordo. Twice in that address he proclaims "Peace, friendship and union," as the only rational outcome of the war (202, 203). General Scott was too good a diplomat to drop into politics unwittingly, and too good a soldier to trespass on forbidden ground. The expressions are the key-note of the whole address, diplomatically put, but certainly intended. The first says, in effect, "The best thing for you Mexicans is peace and union with your brethren and neighbors of the north"; and the second simply says "Barkis is willin'." Was General Scott authorized to make such overtures? Was he the man to make them without authority?

We have omitted all reference to the purely military operations which led up to and resulted in the capture and occupation of the City of Mexico. They are too well known to need description, and too successful to endure comment. We accept them as examples of the military art which we would rather copy than criticise. But our admiration for Scott the commander is almost eclipsed by our admiration for Scott the statesman and administrator. With a steadiness of nerve and consciousness of power which indicate the hand of a master, he stood to the helm of the Mexican ship of state, when she had been abandoned by her crew, and was rapidly drifting on the rocks of anarchy, and steered her into smooth water again. There is no military literature that we know, so worthy of a student's attention, as the orders issued by General Scott in the City of Mexico. His military success was merely the fulfilment of an expectation very generally entertained. His civil success, if military government can be so classified, was a revelation not only to his countrymen but to the world.

And yet, when he was at the very summit of success, on the 12th day of January 1848, a letter was dispatched by the Secretary of War informing him (Scott) that he had been relieved from the command of the army by order of the President of the United States, and was to be brought before a Court of Inquiry to be convened in the Castle of Perote, Mexico, on the 18th of February (248).

It is painful to contemplate such a termination to such a brilliant campaign. Surely "Republics are ungrateful."

JAMES CHESTER,
Captain 3d Artillery.

Modern American Pistols and Revolvers.*

This book will be a surprise to those who look upon pistols and revolvers merely as instruments of crime, and it will show how, within a few years, the practice of target shooting with these weapons, has become a favorite sport in this country. In the pursuit of this peaceful pastime clubs have been formed, club houses have been built, expensive prizes have been offered, and numerous "professional" shots have appeared who pass their lives and make their living in the innocent practice of pistol shooting—pistol shooting, by the way, being an incorrect, though convenient term for describing work with either weapon.

A valuable result has been to change our ideas of the effectiveness and powers of this class of small-arms. Formerly considered a most inaccurate and unsatisfactory weapon, it must now be regarded as a close rival of the rifle in many respects. Probably no person has contributed more to this result than Mr. A. C. Gould, who is better known under his penname of "Ralph Greenwood," editor of several sporting papers of the higher class, and author of some of our best books on fire-arms. His labors have secured a place for pistols and revolvers which was not dreamed of by the makers themselves.

It is found that the pistol is more accurate than the revolver, a result which probably will yet be remedied for there is no difference in the larger weapons. As instances of what is done, we are told that it is not difficult to put a pistol bullet into a circle one inch in diameter at 20 yards, into a $2\frac{1}{2}$ -inch circle at 50 yards, into a 6 inch circle at 100 yards, into a 10-inch circle at 200 yards, into a 30-inch circle at 300 yards. The revolver may be counted on to hit the 1-inch circle at 20 yards, a $3\frac{1}{2}$ -inch circle at 50 yards, an 8-inch circle at 100 yards, a 12-inch circle at 150 yards, a 16-inch circle at 200 yards. Of course better work can be done with a light trigger, reduced charges and special sights, but "jockeying" of this kind is not encouraged, and the results here given are obtained with a 3-pound pull and factory ammunition. All this, and much more of the same kind, is good reading for us, especially for those of us who have been cherishing the idea that we were ourselves experts. Experts we should certainly be, for the revolver is the officer's weapon, and we have every advantage of daily handling our weapons and practice in their use, but it would be well for us not to hang out our pistol medals when we inspect some of the militia, or when we visit some of these pistol clubs.

It is six years since the first edition of "The Modern American Pistols and Revolvers" published facts concerning the capacities of these arms, which were already well known to those who had used them.

A review of the book in the "Journal of the U. S. Cavalry Association," called attention to the fact that the 8-inch bull's-eye was too large, and had been abandoned at the shorter ranges by all who practiced target shooting with the revolver.

Side by side with the rules governing Revolver firing in the U. S. Army, the author publishes the corresponding rules for the Navy, for the Massachusetts militia, and for the Massachusetts rifle association.

We will here discover that the Navy has been provided with the revolver "pack," which we lost sight of five or six years ago. We will see that the Standard American Target, having an eight-inch (circular) bull's-eye is used by civilian shooters at 50 yards; at 30 yards the target is reduced to a 4-inch and at 20 yards it is reduced to a 2-inch bull's-eye. Within the bull's-eye on this target, are two rings, the centre ring being 3.36 inches in diameter; hits on or in this ring count 10, between the first and second ring the count is 9, and between the second ring and the outer line of the

**Modern American Pistols and Revolvers.* By A. C. Gould ("Ralph Greenwood"). Illustrated, New revised edition. Boston: Bradlee Whidden, 1894.

black the count is 8. A study of the rules above referred to also elicits the fact that there are militia who require a qualification of 2 scores of 28 out of 30 at 50 yards to stand in the first class ; 25 out of 30 for second class. In view of these facts and in view of the recent change to a small calibre revolver, the ambitious cavalryman is fain to remark with the young man in Hamlet :—

“On fortune's cap we are not the very button.”

But it must not be understood that Mr. Gould devotes himself entirely to the æsthetic side of pistol shooting. He has travelled through some of our rough communities and has had experience in places where the best man is held to be the quickest “on the drop,” so that his views on acquiring practical proficiency with the arms are valuable. He does not at all approve of shooting with a steady aim and unlimited time as a proper practice for soldiers. He favors shortening the distance and reducing the time, and the natural result of moving targets and disappearing targets. Here again we are given an example in the national guard of Massachusetts, a body which leads the way by requiring the six shots to be fired in one minute.

The author has decided opinions upon the reduction in the calibre of revolvers for military use in this country. After years of studying the revolver, carefully recording the effect of shooting animals as well as men, with various calibres and different charges, he gives his opinion, which he affirms will “stand for years to come,” that “a great mistake has been made in the reduction of calibre in revolvers for military use by the United States Government.”

The Editor of reviews invites me now to say something anent the calibre 38 recently adopted in the army. The weapon is fully described in the book under review. Already on several occasions, in the *Cavalry Journal*, I have attempted in a mild way to enter a protest against this weapon. I am reluctant to reopen the question, for fear of giving color to the statement, which I have heard several times, that I was “looking for” a discussion. Such a thing is of course very far from my thoughts, for life is too short, and other matters are too important, to leave me time for such a thing. I am glad, however, to record such high authority as Mr. A. C. Gould, in support of the contention that a reduction in calibre was not desirable.

The indictment against the new weapon rested on two principal allegations : First, that because it broke to the left, instead of to the right, it was unhandy for a mounted man, and that on this account and for other reasons no time in loading was gained over the old revolver. This statement was based on a single practice, when, in the presence of Lieutenant Powell Clayton, Jr., 5th Cavalry, I took an old issue, Colt's, and fired eighteen shots in a minute, beginning and ending with the chambers empty; my object being to beat the record of one minute and seventeen seconds made by the 38 calibre self-ejector. It was not quick work, and both records can easily be beaten as they probably have been, but it shows that no superiority of this kind can be claimed for the self-ejector.

Second : It was claimed that the most important point to consider was the delivery of a powerful “blow,” and that a reduction of calibre, by weakening the force and effect of this blow, was not desirable. The Ordnance Board had disposed of this point by saying that any reduction could be made which would leave sufficient “stopping power,” and that this could not be determined by any means at hand. It was not, however, acknowledged by the friends of the large calibre that even the 45 in its present shape had sufficient stopping power. Cavalry officers were even advocating an increase of calibre, a round ball, an express bullet, and reduced charges. In support of such views reference was made to a large number of instances furnished by English wars with savage tribes, where the 45 calibre did not give satisfactory results, and where officers armed themselves with horse-pistols instead. It was not thought

necessary to refer to similar records furnished in this country. It was thought that any one who would care to read the record of crime and suicide in an American daily newspaper would find ample support for the view that the small calibre revolver does not give the "stopping power" required of a military fire-arm.

EBEN SWIFT, Captain 5th Cav.

Annual Report of the Commandant of the U. S. Cavalry and Light Artillery School.*

The Annual Report for the year 1893 of the Commandant of the U. S. Cavalry and Light Artillery School contains a detailed account of the splendid and useful work that has been begun at Fort Riley.

Although the Act of 1887 established this school, the new post has still to be built and a course of instruction officially adopted. The first year of real work, fully described in this report, took place during the school year beginning Jan. 10 and ending Dec. 20, 1893.

In prescribing the curriculum, the principal object of the Act of 1887, namely, instruction in the combined operations of cavalry and light artillery was kept constantly in view. This was accomplished: first, by the careful training of the recruits, methods, by the way, which might be taken as models throughout the army; second, by progressive instruction in the detail of the drill of squads, troops, batteries, and squadrons; third, by the preliminaries and thorough conduct of target practice and camping; fourth, by instruction in the theory and practice of minor tactics in every phase practicable for the size and composition of the force at command. This preparation of nine months lead up to the final test of the value of the knowledge and skill thus acquired by officers and men, in combined operations of light artillery and cavalry in manœuvres possible for a small and rather ill-proportioned force.

In spite of all difficulties, and they were numerous and in many instances unnecessary, a series of operations cleverly devised, were prescribed and executed. There were thirteen in all and included many tactical uses of the two arms in situations made possible by the country about the post. There is an absence, however, of operations so characteristic of our cavalry during the war, detours against an enemy's line of supplies, and especially raids designed to destroy railroads and bridges with the useful lessons in the application of the destructive means used to accomplish this. The facilities for manœuvre afforded by the country about Fort Riley must be borne in mind, however, and its characterless topography must have been very trying in the selection and conception of problems that would offer variety and individuality.

To the scheme of field exercises were added rules and principles for the government of the troops in the execution of the manœuvres, including also, instructions as to the functions and general duties of umpires. It was found impracticable to have umpires render decisions on the field, although situations might arise often in which the value of a movement or position might pass unnoticed or unrecognized. The experience of this command seems to sustain the Commandant in the belief that, until more familiarity with the work has been acquired, and a greater number of officers can be detailed as umpires, the system of umpiring best adapted to the situation at that school is one allowing decisions on the field in unmistakable cases only, depending for criticism and correction mainly on written reports, rendered at the completion of each manœuvre.

A good system of umpiring is so necessary, creating, as it tries to do, that important absent element in mock warfare—knowledge of the results of fire—that the want

* *Annual Report of the Commandant of the U. S. Cavalry and Light Artillery School, Fort Riley, Kansas.*

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felt and acknowledged should not remain unsatisfied. The work done so far has been well studied, thoroughly executed and deserving of every praise. As one reads of the simple and soldierly methods by which this series of valuable military lessons was prepared and practically taught, it arouses the question as to the reasonableness and propriety of pursuing a similar course of military development at every cavalry and infantry post in the army. The officers and men at Fort Riley are doing just the routine work of every army in Europe. The scheme of theoretical and practical instruction at this school is susceptible of application, in nearly every particular, at nine-tenths of our posts, omitting the sea-coast forts. The large reservation at Riley offers the special advantages of the frequency with which the field exercises could be conducted, but most posts have within reach space for the practice of many tactical manoeuvres of a simple character and ample opportunity for exercises in road and position sketching, reconnaissances and itineraries.

For example, an exercise similar to "Combined Exercise No. 10" might be executed at any post. This problem was as follows :

No. 10. Forced March of Concentration.

Headquarters Blue Brigade.

Fort Riley, Kansas, 9 A. M., Dec. 20, 1893.

Orders No.—. Information just received necessitates an immediate seizure of Milford. The command will, by a forced march, concentrate at that point at 12 M to-day. A prompt arrival at the exact time specified is of great importance.

The Third Cavalry and two batteries of artillery will proceed by the road north and east of the Republican River. The Seventh Cavalry and one battery of artillery will take the road south and west of the river. A detachment of the Hospital Corps will be detailed to accompany the Seventh Cavalry column.

The country between here and Milford is reported to be free of the enemy, but ordinary precautions should not be neglected.

By order of COLONEL FORSYTH, etc.

Note.—It is desired that the above marches be rapid, forced ones, fully armed. *

Topographical officers will be detailed to accompany each command. * * *

Each man will be supplied with an ample cooked lunch by his respective mess. *

Upon return, the commanding officers will render reports, setting forth the features of the march, time of departure, rate travelled, number and duration of halts, time of arrival and of departure from home and condition of stock. * * *

There is nothing mysterious or difficult in this and yet, as every one knows, a soldier in our army might serve an entire enlistment without having experienced anything but parade ground drills ; or an officer might spend many years doing garrison duty without having made a topographical sketch or written a reconnaissance report.

It is to be regretted that the Commandant of the School directed so little of his report to the conditions affecting the Artillery Sub-School. His report leaves the matter in the hands of the commanding officer of this sub division who gives the doings and needs of his command scant mention. It would have been interesting to know by what detailed instruction the efficiency of the artillery command was attained and if any methods other than those commonly employed in our light batteries were introduced. The course of instruction in the cavalry indicates thoughtful originality and a thoroughness superior to custom, offering an excellent model for general use.

The Commandant recommends that : the cavalry be increased to 12 troops, each on a war footing ; each regiment of cavalry be represented at the school ; organizations have the full complement of officers present for duty, and officers and troops be not detached during the tour of instruction, except for most urgent necessity ; the number of quarters, barracks and stables be increased and a more liberal allowance of

ammunition supplied to the light batteries. In this connection, would it not have been just and proper for the commanding officer of the Artillery Sub-School to have recommended that the regiments of artillery should not be represented at the school by more than one light battery?

The Commandant's report was printed at Junction City, Kansas, presumably at private expense. The Government might well have had this work done by the public printer for distribution in the cavalry and artillery, which ought to be warmly interested in the work of this school.

Without meaning to be hypercritical might not the reviewer aver that it is not altogether technical to speak, as has the Commandant, of a "Shrapnel broadside" delivered by a light battery?

H. L. HAWTHORNE, Lieut. 4th Artillery.

Two Views of Waterloo.*

In a work "The Campaign of Waterloo: a Military History," by J. C. Ropes, published by Putnam & Co., New York, the author maintains that Napoleon's arrangements were perfectly designed and should have insured success. If his generals had executed his orders well, the Prussian army would have been destroyed and Wellington paralyzed, if not defeated.

Blücher's arrangements were, he says, very defective, while Napoleon's tactics were immensely superior. The author considers the falling back of Blücher and Wellington, the one on Wavre and the other on Waterloo, as very bad strategy. This double movement exposed Wellington to crushing defeat on the 17th, and the author of the work quoted approves of Napoleon's view, that his enemies should have retreated on Brussels, concentrating their combined armies, for in that case they would have opposed an infinitely superior force to that of the Emperor. A series of accidents saved the Allies from what should have been their ruin. It is stated that the remissness of Ney, Soult, and Grouchy on the 17th prevented a victory for the French.

A different view is held by General John Watts de Peyster, the author of "Waterloo: the Campaign and the Battle," a work published by the same firm as the one previously alluded to. "Instead," he writes, "of Napoleon launching a column of crushing weight against the English left, and interposing decisively between Wellington and Blücher; or instead of making a vigorous demonstration against the British centre and a less vigorous one against the British right, Napoleon attacked in force what was about the strongest point in Wellington's line (the right), thus assaulting a prepared and strengthened stronghold with infantry alone, losing first and last in the course of the attempt 5000 men." It is conceded by de Peyster that Napoleon in the Waterloo campaign was an invalid, physically unfit for the part he undertook to play, and that pity for emasculated greatness should condone many failings. No one will be likely to dispute the assertion that "a man is not fit for vigorous thought who is sitting a-straddle on red-hot coals sprinkled with corrosive acid."

Mr. Ropes, however, and those who agree with him, do not concede that Napoleon was physically unfit to command at Waterloo. Indeed, there is no need for such concession if the Emperor's arrangements were perfectly designed and failed by reason only of the remissness of his subordinates. At the same time, General de Peyster does not admit that Wellington won the battle of Waterloo. Such an assertion, in his view, would be a perversion of terms. "It is the truth (and that is glory enough for him and his troops) that they held their own so long against such terrible odds. Blücher decided, and therefore technically as well as virtually, won the battle, and gleaned as well as gathered the fruits."

* *Waterloo*. By J. Watts De Peyster, M.A., LL.D., Lit. D, Brev. Maj.-Gen., N. Y.

In fine, General de Peyster considers the views of the author of the "Campaign of Waterloo" erroneous, and sums up as follows: "The generalship displayed by Bonaparte at Waterloo was in many respects stupidity itself, in spite of the praise bestowed on it by Thiers and other writers."—*United Service Gazette*.

Training Remount Horses.*

In a neat little book of thirty-two pages Lieutenant Blunt, 5th Cavalry, gives in concise form the most essential points to be borne in mind by those engaged in transforming the remount horse as he is received into the troop horse as he should be. Lieut. Blunt has sketched out what experience has taught him to be the easiest means of accomplishing this transformation.

The author has endeavored, and with success, to place before the officers acting as riding-masters the points more especially insisted on in the riding schools of other services, where more care and attention are given to such matters than in our own. It would scarcely be possible to convey more valuable information in the space occupied in this book upon the subject treated. Nor is it confined to the cavalry alone, every one who has to do with horses will find it of value.

Geography Directory and Condensed History.†

In the beautiful highlands just below West Point, Lieut. Braden, retired, devotes his leisure to preparing young men for the initial examinations for entrance to the Military Academy at West Point and the Naval Academy at Annapolis.

In the course of his work he has made these and other compilations as aids to candidates.

The arrangement is such as easily to aid the memory in fixing the principal facts in a manner readily learned and remembered.

The ground is sufficiently covered to enable any student who knows the contents of these little books to pass the examinations in the subjects named at either one of the National Academies.

The Salem Light Infantry.‡

The Salem Light Infantry Company was organized in Salem, Mass., May 1, 1805, and began its career under the command of Capt. John Saunders.

The subsequent history up to 1861 is mainly made up of records of drills, dinners and inspections, but on April 18, 1861, the Company, 70 strong, under Captain Arthur F. Devereux, was assigned to the 8th Regiment Mass. Volunteers, Col. Timothy Munroe, and under command of Gen. B. F. Butler left Boston for Washington and served till July 29 of the same year.

Later, in September of '62 the Light Infantry again went to the front, but this time as part of the 50th Mass. Vols. and reported to Maj.-Gen. N. P. Banks and served under that officer in the Department of the Gulf at Baton Rouge and Port Hudson until the surrender of the latter place, in July 1863. The Salem Light Infantry had representatives in over fifty regiments and other organizations during the late war. After this service the record again reverts to matters common to most organizations of like nature. The book is handsomely printed and forms a creditable history of this company of light infantry.

* *Maxims for Training Remount Horses for Military Purposes*. By J. V. Mason Blunt, Lieutenant Fifth Cavalry, U. S. A. D. Appleton and Company. New York, 1894. Price 50 cts.

† *Geography Directory and Condensed History of the United States*. Compiled by Lieut. Charles Braden, U. S. Army, West Point, N. Y.

‡ *History of the Salem Light Infantry from 1805 to 1890*. By George M. Whipple. Essex Institute, Salem, Mass., 1890.

Historical Sketches of the Army.

THE following named officers have volunteered, or have been designated to prepare Historical Sketches of their Corps or Regiments for publication in this JOURNAL.

*Adjt. General's Dept.....	GEN. J. B. FRY.
*Judge Adv. General's Dept.....	COL. J. W. CLOUS.
*Quartermaster's Dept.....	CAPT. O. F. LONG.
*Subsistence Dept.....	GEN. J. W. BARRIGER.
*Medical Department.....	MAJOR CHAS. SMART.
*Pay Department.....	COL. A. B. CAREY.
*Corps of Engineers.....	GEN. H. L. ABBOT.
*Ordnance Department.....	MAJOR C. E. DUTTON.
*Signal Corps.....	LIEUT. WM. A. GLASSFORD.
1st Cavalry.....	CAPT. R. P. P. WAINWRIGHT.
*2d Cavalry.....	MAJOR A. E. BATES and CAPT. E. J. McCLERNAND.
3d Cavalry.....	CAPT. CHARLES MORTON.
*5th Cavalry.....	LIEUT. EBEN SWIFT.
*6th Cavalry.....	CAPT. WM. H. CARTER.
7th Cavalry.....	CAPT. E. A. GARLINGTON.
*8th Cavalry.....	CAPT. C. M. O'CONNOR.
9th Cavalry.....	LIEUT. GROTE HUTCHESON.
*10th Cavalry.....	CAPT. JOHN BIGELOW, JR.
1st Artillery.....	MAJOR W. L. HASKIN.
*2d Artillery.....	LIEUT. W. A. SIMPSON.
*3d Artillery.....	LIEUT. W. E. BIRKIMER.
*4th Artillery.....	LIEUT. A. B. DYER.
5th Artillery.....	LIEUT. J. C. BUSH.
1st Infantry.....	CAPT. F. H. EDMUNDS.
2d Infantry.....	LIEUT. W. M. WRIGHT.
3d Infantry.....	LIEUT. J. H. MCRAE.
*4th Infantry.....	LIEUT. J. A. LEYDEN.
*6th Infantry.....	LIEUT. CHAS. BYRNE.
7th Infantry.....	LIEUT. A. B. JOHNSON.
*8th Infantry.....	LIEUT. R. H. WILSON.
*9th Infantry.....	CAPT. E. B. ROBERTSON.
*10th Infantry.....	CAPT. S. Y. SEYBURN.
*11th Infantry.....	MAJOR J. H. PATTERSON and CAPT. R. C. J. IRVINE.
*12th Infantry.....	LIEUT. CHAS. W. ABBOT, JR.
*14th Infantry.....	COLONEL T. M. ANDERSON.
*15th Infantry.....	CAPT. H. R. BRINKERHOFF.
*16th Infantry.....	CAPT. WM. V. RICHARDS.
17th Infantry.....	CAPT. CHAS. ST. J. CHUBB.
*18th Infantry.....	LIEUT. C. H. CABANISS, JR.
*19th Infantry.....	CAPT. C. C. HEWITT.
*20th Infantry.....	CAPT. J. N. COE.
*21st Infantry.....	CAPT. FRED. H. E. EBSTEIN.
*22d Infantry.....	CAPT. O. M. SMITH, C. S.
23d Infantry.....	LIEUT. J. K. THOMPSON.
24th Infantry.....	CAPT. H. W. HOVEY.
*25th Infantry.....	CAPT. GEORGE ANDREWS.

* Published in JOURNAL.



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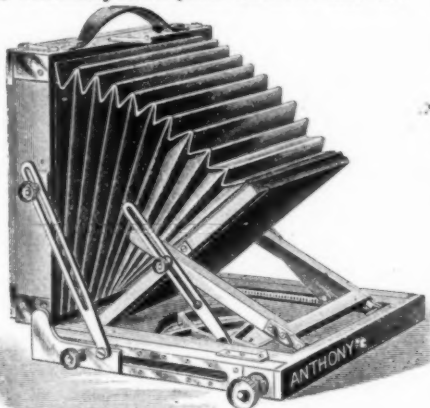
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Prize Essay—1894.

I.—The following Resolution of Council is published for the information of all concerned :

Resolved, That a Prize of a Gold Medal of suitable value, together with a Certificate of Life Membership, be offered annually by THE MILITARY SERVICE INSTITUTION OF THE UNITED STATES for the best essay on a military topic of current interest ; the subject to be selected by the Executive Council and the Prize awarded under the following conditions :

1. Competition to be open to all persons eligible to membership.
2. Each competitor shall send three copies of his Essay in a sealed envelope to the Secretary *on or before September 1, 1894*. The Essay must be strictly anonymous, but the author shall adopt some *nom de plume* and sign the same to the Essay, followed by a figure corresponding with the number of pages of MS.; a sealed envelope bearing the *nom de plume* on the outside, and enclosing full name and address, should accompany the Essay. This envelope to be opened in the presence of the Council after the decision of the Board of Award has been received.
3. The prize shall be awarded upon the recommendation of a Board consisting of three suitable persons chosen by the Executive Council, who will be requested to designate *the Essay deemed worthy of the prize*; and also in their order of merit those deserving of honorable mention.
4. In determining the essay worthy of the prize, the Board will be requested to consider its professional excellence, usefulness, and valuable originality, as of the first importance, and its literary merit as of the second importance. Should members of the Board determine that no essay is worthy of the prize, they may designate one or more essays simply as of honorable mention ; in either case, they will be requested to designate one essay as first honorable mention. Should the Board deem proper, it may recommend neither prize nor honorable mention. Should it be so desired, the recommendation of individual members will be considered as confidential by the Council.
4. The successful Essay shall be published in the Journal of the Institution, and the Essays deemed worthy of honorable mention shall be read before the Institution, or published, at the discretion of the Council.
5. Essays must not exceed twenty thousand words, or fifty pages of the size and style of the JOURNAL (exclusive of tables).

II.—The Subject selected by the Council at a meeting held Nov. 24, 1893, for the Prize Essay of 1894, is

“ DISCIPLINE :—Its Importance to an Armed Force and the best means of Promoting and Maintaining it in the United States Army ”

III.—The gentlemen chosen by the Council to constitute the Board of Awards for the year 1894 are :

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Silver Medal, American Institute, New York, 1876.

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Silver Medal, Austria, 1879.

Gold Medal, Royal Agricultural Society, London, Eng., 1879.

Gold Medal, Exposition des Sciences Appliquées à l'Industrie, 1879.

Both Gold and Silver Medals, The International Health Exhibition, London,
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"JUDGE ADVOCATE GENERAL'S DEPARTMENT."

BY LIEUT.-COL. J. W. CLOUS, DEP. J. A. GENERAL,

PROFESSOR OF LAW, U. S. M. A.

HISTORY is said to repeat itself. Mr. Clode in his treatise on the military and martial law of England, says that in the English civil war of the 17th century the opposing armies of the king and of the parliament were governed under the same military code. So in 1775 the same thing happened in this country. At that time the "Ministerial" Army, as Gage's and Burgoyne's forces were called, was governed by the British Mutiny Act and Articles of War. When the Continental Congress raised an army in defense of the liberty of America, that assembly could find no military code better suited to their requirement than the then current British Articles of War, and accordingly on the 30th of June, 1775, they put forth Articles of War (sixty-nine in number) on the model of the English for the government of the Continental army.

The adoption of this code was followed on the 29th of July, 1775, by the creation of the office of "Judge Advocate of the Army" to which on the same day William Tudor, a law pupil of John Adams and a leading counsellor of Boston, was elected. The title of Judge Advocate General was attached to this office on August 10, 1776, and the amended Articles of War, adopted on September 20, 1776, by the Revolutionary Congress of the United States provided that "The Judge Advocate General, or some person deputed by him, shall prosecute in the name of the United States of America."

William Tudor, having resigned in 1777, was succeeded by John Lawrance, a distinguished jurist, who had served with the army in the field both as a regimental and as a staff officer. Meanwhile certain deputy judge advocates were appointed for different armies and for the army at large.

Colonel Lawrance resigned in 1782, and was succeeded by his principal deputy, Thomas Edwards, who, so far as the records show, was the last incumbent of the office of Judge Advocate General prior to the adoption of the Constitution.

Under the Act of March 3, 1797, reorganizing the army, Captain Campbell Smith, 4th Infantry, was appointed to the office of Judge Advocate to the army. He continued to hold the office till it ceased to exist by the force of the Act of March 16, 1802, which also reduced the line of the army to one regiment of artillery and two of infantry.

Next, we find that the Act of January 11, 1812, provided for the appointment of one Judge Advocate to each division, and the statute of April 24, 1816, "for reorganizing the general staff" increased this number to three for each division, but by the Act of April 14, 1818, this change

was repealed and the former number restored. Among the eighteen judge-advocates appointed under this act we find the name of Henry Wheaton, the eminent publicist, professor of law, and diplomat, whose work on the "Elements of International Law" is to-day one of the standard authorities.

By the operation of the Act of March 2, 1821, reducing the military establishment of the United States, the office of the Judge Advocate was discontinued, and remained so until the Act of March 2, 1849, authorized the President to appoint a suitable person as Judge Advocate of the army, to be taken from the captains of the army, Captain John F. Lee of the Ordnance Department was accordingly appointed, and held the office until it was superseded by the legislation of 1862.

The Act of July 17, 1862, created the office of Judge Advocate General, with the rank, pay and allowance of a colonel of cavalry, and authorized the appointment of a judge advocate, with the rank and pay of a major of cavalry, for each army in the field.

Under the Act of June 20, 1864, the Bureau of Military Justice was created, attached to, and made a part of, the War Department, during the continuance of the then existing War of the Rebellion. The Judge Advocate General was made the head of this Bureau and given the rank and pay of a brigadier general. The appointment of an Assistant Judge Advocate General with the rank and pay of colonel of cavalry was also authorized.

Upon the reorganization of the army under the Act of July 28, 1866, the Bureau of Military Justice with its organization was continued in operation and ten of the judge advocates then in office retained in service and soon after made part of the regular establishment of the army. By the subsequent Act of April 10, 1869, this number was fixed at eight.

Under the Act of June 24, 1874, the office of Assistant Judge Advocate General was discontinued and no appointments in the corps of judge advocates were to be made until the number was reduced to four, which was to be the permanent number of the officers of that corps.

The Bureau of Military Justice and the Corps of Judge Advocates of the army were by the act of July 5, 1884, consolidated under the title of "Judge Advocate General's Department," to consist of one Judge Advocate General with the rank, pay and allowances of a brigadier general, one Assistant Judge Advocate General with the rank, pay and allowances of a colonel; three Deputy Judge Advocate Generals, with the rank, pay and allowances of lieutenant colonels; and three judge advocates, with the rank, pay and allowances of majors and under the same act the Secretary of War is authorized to detail such number of line officers as may be necessary to serve as acting judge advocates of Military Departments, who shall have the rank, pay and allowances of captains of cavalry. This is the present organization of the Judge Advocate General's Department, and under the authority just quoted there are present five officers of the line serving as acting judge advocates of Departments. These have been specially selected from the first lieutenants of the line, who have studied law and been admitted to the bar.

Under the existing statutes the Judge Advocate General is required "to

receive, revise and cause to be recorded the proceedings of all courts-martial, courts of inquiry, and military commissions and to perform such other duties as have been performed heretofore by the Judge Advocate General of the army," and under his direction the "judge advocates shall perform their duties." In connection with the duties thus specified the Judge Advocate General is required by existing regulations to render reports to the Secretary of War upon such cases tried by military courts as require the action of the President, as well as when applications for clemency or other relief are presented to the President or Secretary of War by persons who have been convicted by military courts. He also prepares and revises charges and renders opinions upon all such questions of military law as may be referred to him for opinion by the Secretary of War or the Commanding General of the army. He also assists the latter in the review of cases of courts-martial coming under his cognizance.

The "other duties" of the Judge Advocate General mentioned in the statute consist in the preparation of all sorts of legal papers, and in the rendering of opinions upon all questions of law arising in the administration of the War Department referred to him under the interior business regulations established by the Secretary of War. In this connection the Judge Advocate General is in effect the law officer of the War Department, holding practically the same relation of advisory counsel to the Secretary of War as is held by the several solicitors or Assistant Attorneys General towards the chiefs of the executive department to which they are attached.

The acting judge advocates and judge advocates detailed for duty at Department headquarters are under the immediate command of Department commanders, and their duties chiefly consist in preparing or revising charges, serving on general courts-martial, examining, revising and reporting upon the records of military courts received at the headquarters at which they are serving, and generally in assisting their immediate commanders in the examination of questions of law arising in the administration of their commands. These officers are frequently called upon to appear as counsel for the United States, or for officers or soldiers of the army in the courts of the United States, in *habeas corpus* and other proceedings as well as before the civil and criminal courts of the States and Territories within the command to which they are attached. It is therefore necessary that they should have a legal education and be members of the bar.

Since 1874, one of the judge advocates of the army has been from time to time assigned to duty as Professor of Law of the United States Military Academy, at West Point, New York.

In the preparation of the foregoing paper the writer has made free use of the "Sketch of the History and Duties of the Judge Advocate General's Department" prepared by the Judge Advocate General and dated March 1, 1878.

This sketch would be incomplete without a reference to the effect produced by the Civil War upon the administration of military justice in the army, the Judge Advocate General's Department being the agency through which great changes were brought about.

It may justly be said that before the War of the Rebellion we had no mil-

itary jurisprudence. The jurisdiction exercised by military tribunals was withdrawn from public observation, their decisions were buried in the War Department. Writers on military law could draw under ordinary circumstances few materials from sources similar to those which furnish any writer on constitutional law both information and authority.

Scattered into small commands, occupying widely separated stations on a vast frontier, without connection by railroads or telegraphs, with superior headquarters located at a great distance, the greatest portion of our small army served for years preceding the war far removed from civilization, protecting the enterprising pioneer in his search for a new home in the far west. Beyond the reach of civil authority, obliged to maintain discipline among his troops, and in duty bound to give to the settlers within the vicinage and to the passing immigrant that protection of life and property which is in organized civil communities obtained through the local civil authorities, the commanding officer of a frontier station was often forced to resort to the law of necessity for the preservation of discipline within and good order and security without. Arbitrary punishments therefore had often to take the place of trials by courts-martial. Absolute master within, and from without the only power that could be invoked by the civilian for his protection, the commanding officer exercised more power than was ever contemplated to be conferred by the genius of our institutions upon a military officer in time of peace.

Under these conditions the call to arms sounded in 1861, and the scattered regular forces, when replaced by volunteers, were collected and sent to the front. Many of their officers took high positions in the newly organized volunteer forces.

The men comprising these new forces, coming from all walks of life, brought up under the ægis of civil law, under which they could only be tried by their peers and according to the law of the land, did not take kindly to the arbitrary punishments for infractions of discipline, as administered to a great extent in the regular forces. The publicity of these punishments, the influence of the press, and the interest taken by the public at large in the citizen soldiery, as reflected by the members of Congress with a large number of their constituents in the ranks of the army of the Union; finally led to the abandonment of unauthorized punishments and of punishments not in accord with the spirit of public opinion of the times.

The importance of the administration of military justice under the military code and under the laws of war increased in proportion as the field of military operations was extended and new armies were raised. The agency which supervised this branch of staff administration in the army up to the beginning of the Civil War was without an organization capable of expanding and meeting the new demands made upon it. There was but one officer, and his duties had been confined to taking charge of the records of courts-martial. An eminent statesman and able jurist, the Hon. Joseph Holt, was appointed Judge Advocate General by President Lincoln upon the creation of that office by Congress in 1862, and a corps of judge advocates was created at the same time. Under this legislation and until the close of the war thirty-nine officers were appointed in that corps. They had generally

performed active service in the field as volunteer officers and all of them had a legal education. Previous to their appointment the administration of military justice in the field was almost entirely in the hands of volunteer officers. Among them were judges who had left the bench and lawyers who had abandoned their briefs to take up arms for the cause of the Union. Many of them found their way to places where their legal training made them useful to commanding generals in the discharge of their duties as convening and reviewing officers of courts-martial. As an evidence of the valuable and eminent services of these officers, as well as of those of the corps of judge advocates in their new field, it is only necessary to refer to the scholarly reviews of courts-martial proceedings published in the orders of the various armies.

During the great struggle for the supremacy of the Union every line of our military code was brought into practice and when necessary interpreted and construed. Military law is but a part of the law of the land, and there is no distinction between it and other portions of the law in respect to the rules according to which it should be construed, or in respect to the necessity of observing established principles in its administration. Besides this, nearly every crime known to the common law was brought within the jurisdiction of military courts.

Our military jurisprudence was thus founded during the most critical period of our national history by General Holt with the assistance of his able corps of judge advocates. To one of these—Colonel Winthrop—the army is indebted for a treatise on military law in which for the first time are collected for the benefit of the soldier, the lawyer, the judge and the historian, the precedents, decisions and opinions which have become part of our law military.

In substance and form our Articles of War were but little changed during the War of the Rebellion. During the past eight years, however, important improvements have been made in our military code. Previous convictions are now authorized to be taken into consideration in awarding punishments upon conviction; enlisted men are furnished with counsel at their request; judge-advocates of courts-martial are excluded from the closed sessions of courts; a code of punishment has been established by the President under authority of an act of Congress; summary courts have been created; judge advocates and trial officers of summary courts are authorized by law to administer oaths in military cases, etc. Nearly all of these changes had their origin in recommendations emanating from the office of the Judge Advocate General.

The duties of judge advocates are inseparable from the military system of every civilized nation. But under the genius of our institutions, officers educated both in military and civil law are necessary adjuncts of our military administration. Subordination of the military to the civil authorities is an axiom in our government; the military person is amenable to the jurisdiction of the civil courts of the land, both state and national. As an eminent statesman aptly remarked, "this is a government of law, and all authority received must find its warrant thereunder."

THE SIXTH REGIMENT OF INFANTRY.*

BY LIEUTENANT CHARLES BYRNE, ADJ. 6TH U. S. INFANTRY.

THE first mention of the Sixth Infantry is found in the Acts of Congress of July 16, 1798, and March 3, 1799.

Of the thirty officers constituting the commissioned strength Aug. 1, 1799, twenty-seven were appointed from North Carolina and three from Tennessee, and orders from the War Department of Jan. 5, 1800, direct that this regiment be recruited in North Carolina; but on June 15 following we find it disbanded under the Act of May 14, 1800.

April 12, 1808, should be considered the birthday of the present Sixth Infantry. For under the Act of Congress of that date the regiment was organized, and it has since then been continuously in service.

Its first colonel was Jonas Simonds, appointed from Pennsylvania on July 8, 1808, and his name, with those of Joseph Constant (lieutenant-colonel) from New York, and Zebulon M. Pike (major) from New Jersey, and the names of ten captains, ten first lieutenants, ten second lieutenants, nine ensigns, one surgeon, and one surgeon's mate, appear in the commissioned roster of the regiment for January, 1809.

During the War of 1812-15 the Sixth Infantry took part in the battles of Heights of Queenstown, U. C., Oct. 13, 1812; York, U. C., April 27, 1813; Fort George, U. C., May 27, 1813; and the siege of Plattsburg, N. Y., September 6 to 11, 1814.

March 1, 1815, found Colonel Jonas Simonds still at the head of the regiment; but, in the reduction of the army of that year under the Act of March 3, 1815, the Sixth was re-organized, and consolidated with the 11th, 25th, 27th, 29th and 37th Regiments of Infantry, and Colonel Henry Atkinson of the 37th was retained as its colonel.

In regimental orders dated Fort Lewis, N. Y., Aug. 27, 1815, Colonel Atkinson "assumes the command of the Sixth Regiment of Infantry," and on the 4th of September the regiment embarked at Fort Lewis for Governor's Island, N. Y., where it arrived the following day and remained until April 16, 1816, when it left on transports for Troy en route to Plattsburg, N. Y., where it arrived on the 30th and remained until the spring of 1819.

The regiment left Plattsburg for St. Louis, Mo., on March 19, 1819, and reached Pittsburgh early in May, where orders were issued at camp near Pittsburgh, May 8, for the embarkation of the regiment on transport boats for St. Louis.

The boats were numbered from 1 to 10, and followed each other in that order. They were propelled by oars and sails, and there was a regular system of signals provided in orders for their government.

* An abridgment of Lieut. Byrne's "Sixth U. S. Infantry. Regimental Press 6th Inf. Fort Thomas, Ky. 1893.

This fleet of boats with the Sixth Infantry on board was off Cincinnati, May 15, 1819. So that more than seventy-three years ago the regiment passed down the Ohio under the shadow of the Kentucky hills where Fort Thomas, its present station, is now so beautifully situated.

On June 8, it left the transports and went into camp at Belle Fontaine, Missouri.

Here the regiment awaited supplies and transportation until July 4, when it embarked for Council Bluffs, and reached Camp Missouri, near Council Bluffs, in September. Colonel Atkinson in a private letter says:

"Here from the vicinity of several powerful tribes of Indians it became necessary to establish a post. The troops were landed and put to work to cover themselves for the winter and erect the necessary defenses, all of which were completed in season, and we remained contented with the prospect of sending one of the regiments to the mouth of the Yellowstone early in the spring. The rifle regiment, which was stationed at a point four hundred and fifty miles up the Missouri, was joined to my command."

This was known as the Yellowstone Expedition of 1819; but as Congress the following winter declared against the expediency of its further progress, the expedition terminated at Council Bluffs.

On May 13, 1820, Colonel Atkinson was promoted to the grade of brigadier general, and was succeeded by Colonel Ninian Pinkney, promoted from the 2d Infantry.

The following session of Congress the army was reduced, and under the Act of March 2, the Sixth was again re-organized by consolidation with the Rifle Regiment at Fort Atkinson (Council Bluffs), May 4, 1821; and General Henry Atkinson was retained as colonel of the Sixth Infantry with the brevet of brigadier general, filling the vacancy made by the transfer of Colonel Pinkney to the 3d Infantry, August 16, 1821.

The buildings constructed (at Fort Atkinson) by the troops consisted of four blocks of hewed log barracks comprehending eighty-eight rooms, with shingle roof, plank floor, and a brick chimney to each; with a strong magazine, and the best kind of wooden store-houses, of ample size, for the quartermaster's and subsistence departments; a saw mill, capable of sawing fifteen hundred feet of plank per day; and a grist mill that would grind one hundred and fifty bushels per day.

The land under cultivation was estimated at 506 acres.

The Sixth Infantry thus built the first United States fort west of the Missouri River, and started the earliest settlement in Nebraska. Fort Atkinson was afterwards known as Fort Calhoun, in honor of John C. Calhoun, Secretary of War. It was situated on the original Council Bluffs, about twenty miles distant from the present city of that name and about sixteen miles from the site of Omaha. The nearest settlements were St. Louis on the south, Prairie du Chien on the east, and the fort of the Hudson Bay Company at Vancouver, in the northwest.

While the Sixth was at Fort Atkinson in June, 1823, it was led by its lieutenant colonel, Henry Leavenworth, to the relief of General Ashley's party, which had been attacked by and was in imminent danger from the Arikara Indians.

The expedition resulted in the defeat of the Indians and the destruction of their villages, and the Adjutant-General in acknowledging to the Department Commander the receipt of the detailed report of the operations of Colonel Leavenworth's command says: "These papers have been submitted to the General-in-chief, who directs me to express to you his high satisfaction with the success of the expedition and his approbation of the conduct of Colonel Leavenworth and his officers, to whom he desires you to convey his thanks for the zeal and activity which they have displayed upon this occasion."

The regiment remained at Fort Atkinson until April, 1827, when it was transferred to Jefferson Barracks, Mo., where it was established with part of the 3d Infantry, and the post was regarded as the Infantry School of Practice of that day. The famous old Regimental Mess originated about this time and lasted for more than twenty years, until after the return from Mexico in 1848.

General Atkinson, the colonel of the Sixth Infantry, was the first commandant of Jefferson Barracks.

In May, 1829, Companies A, B, F and H, under Brevet Major Bennet Riley, were detached from the regiment to escort the overland traders to Santa Fé, and on their return in the fall they took post at Fort Leavenworth.

These companies returned to headquarters in December, 1831, and the regiment was again concentrated at Jefferson Barracks, preparatory to taking the field against the Sac and Fox Indians in the Black Hawk War. By June, 1832, it had reached Dixon's Ferry and was actively engaged in the campaign conducted by its colonel as commander of the frontier forces of the northwest.

On August 2d, General Atkinson's army, of which the Sixth under Lieut. Col. Daniel Baker formed a large part of the regular brigade, came up with Black Hawk at the junction of the Bad Axe and Mississippi rivers, and immediately attacked him. The battle lasted about three hours. The Indians fought with desperation, but were defeated and dispersed, suffering a loss of about two hundred killed and wounded.

This action was the finishing stroke of the war, and Black Hawk, deserted by his followers, soon after surrendered to the agent at Prairie du Chien. General Atkinson, in orders, expressed his approbation of the brave conduct of the troops engaged, referring to the fact that the regular troops among others were, from their position in order of battle, more immediately in conflict with the enemy. The orders in this case were signed, as A. D. C. and A. A. A. G., by Albert Sidney Johnston, then adjutant of the regiment.

Regimental orders of September 7, 1832, appoint as adjutant Lieut. Philip St. George Cooke, who afterwards entered the dragoons and in 1861 became a brigadier general.

On October 2d the regiment arrived at Jefferson Barracks.

From December 1832 until August 1834, Companies A, B, F and H, were stationed at Fort Leavenworth, the headquarters and six companies remaining at Jefferson Barracks, where the entire regiment was concentrated in September 1834.

The regiment left Jefferson Barracks on February 29, 1836, en route to

Louisiana, and by April 17th, was concentrated at Camp Sabine, Louisiana, with the exception of Company G which joined on June 5th. By November 30th Companies C, D and E, were at Fort Worth, La.; I and K at Camp Sabine; and the remainder, with headquarters, at Fort Jessup.

The Sixth Infantry was now under orders for Florida, destined to be the field of its greatest glory.

Companies C, D and E were sent to take station at Camp Sabine, La., where they arrived December 27. The headquarters, with Companies A, B, F, G, H, I and K, left Fort Jessup, December 19; arrived at New Orleans Barracks the 22d; embarked the 29th for Tampa Bay, and on February 28th were at Fort Dade, East Florida. By November 14th, with Lieut. Col. A. R. Thompson in command, they had arrived at Fort Taylor.

The Sixth (excepting Companies C, D and E) under its lieutenant colonel was now part of a separate column commanded by Colonel Zachary Taylor of the 1st Infantry, who on December 19th received orders to proceed with the least possible delay against any portion of the enemy he might hear of within striking distance, and to destroy or capture him.

After leaving an adequate force for the protection of his depot, he started with Captain Munroe's company of the Fourth Artillery, thirty-five men; the First Infantry, under the command of Lieut. Col. Foster, two hundred and seventy-four; the Sixth Infantry under Lieut. Col. Thompson, two hundred and twenty-one; the Missouri Volunteers, one hundred and eighty; Morgan's spies, forty-seven; pioneers, thirty; pontoneers, thirteen; and seventy Delaware Indians; making a force, exclusive of officers, of 870 men.

On December 25, 1837, Colonel's Taylor's army came upon the enemy strongly posted in a dense hummock, perfectly concealed and confident of victory. Their number has been variously estimated up to seven hundred. The engagement was brought on by Morgan's spies and the volunteers under Gentry. These troops moved gallantly forward, exposed to a heavy fire, which, accompanied by infernal yells, was poured in upon them from the tree tops and from every thicket and concealment.

Colonel Gentry fell mortally wounded; his men began to stagger, and finally, seized with a panic, broke and fled in wild disorder.

After referring to the repulse of the volunteers, and the failure of repeated efforts to bring them again into action, Colonel Taylor, in his detailed report of the battle of Okee-cho-bee, says:

"The enemy, however, were promptly checked and driven back by the 4th and 6th Infantry, which in truth might be said to be a moving battery.

"I am not sufficient master of words to express my admiration of the gallantry and steadiness of the officers and soldiers of the Sixth Regiment of Infantry. It was their fortune to bear the brunt of the battle. The report of the killed and wounded, which accompanies this, is more conclusive evidence of their merits than anything I can say. After five companies of this regiment, against which the enemy directed the most deadly fire, were nearly cut up, there being only four men left uninjured in one of them; and every officer and orderly sergeant of those companies, with one exception, were either killed or wounded; Captain Noel, with the remaining two companies, his own company, 'K,' and Crossman's, 'B,' commanded by Second Lieutenant Woods, which was the left of the regiment, formed on the right of the Fourth In-

fantry, entered the hummock with that regiment and continued the fight and the pursuit until its termination.

"It is due to Captain Andrews and Lieutenant Walker, to say they commanded two of the five companies mentioned above, and they continued to direct them, until they were both severely wounded and carried from the field; the latter received three separate balls."

He speaks in complimentary terms of Lieut. George H. Griffin, 6th Infantry, on his personal staff and an aide-de-camp to Major-General Gaines and a volunteer from his staff in Florida.

Colonel Taylor continues:

"It is due to his rank and talents, as well as to his long and important services, that I particularly mention Lieut. Col. A. R. Thompson, of the Sixth Infantry, who fell in the discharge of his duty, at the head of his regiment. He was in feeble health, brought on by exposure to this climate during the past summer, refusing to leave the country while his regiment continued in it. Although he received two balls from the fire of the enemy early in the action, which wounded him severely, yet he appeared to disregard them and continued to give his orders with the same coolness that he would have done had his regiment been under review or on any parade duty. Advancing, he received a third ball, which at once deprived him of life. His last words were: 'Keep steady, men, charge the hummock—remember the regiment to which you belong.'"

"Captain Van Swearingen, Lieutenant Brooke, and Lieutenant and Adjutant Center, of the same regiment, who fell on that day, had no superiors of their years in service, and in point of chivalry ranked among the first in the army or nation."

As has been said by Colonel Taylor, the most conclusive evidence of the glorious record of the gallant Sixth on that bloody Christmas of 1837, is the official list of those who fell killed and wounded in the action.

RETURN OF THE KILLED AND WOUNDED AT THE BATTLE OF
OKEE CHO-BEE.

Regiments and Corps.	Commanded by.	Killed.		Wounded.	
		Offi- cers.	Men	Offi- cers.	Men.
Regulars.					
1st Infantry.....	Lieut. Col. Davenport.....				4
4th Infantry.....	Lieut. Col. Foster.....		3	1	18
6th Infantry.....	Lieut. Col. Thompson....	4	16	2	53
Mounted 4th Infantry..	Captain Allen.....				1
Volunteers.					
Missouri Volunteers.....	Colonel Gentry.....	1	1	3	22
Spies.....	Lieut. Col. Morgan.....		2	3	4
Indians.....	Captain Parks.....				
Total		5	22	9	102

Of the Sixth Infantry, Lieut. Col. A. R. Thompson was wounded in three places before he fell. The first ball passed through the abdomen to the left, the second in the right breast, and the last through the chin and neck, evidently shot from a tree. He fell in a sitting posture, uttering as he died the memorable words quoted in Colonel Taylor's report.

Captain J. Van Swearingen was shot in advance of his company, in the

lower part of the neck. When passing to the rear he raised both hands to his head, fell flat on his face, and expired instantly. Lieutenant and Adjutant J. P. Center was shot through the head from a tree, and expired on the spot. First Lieut. E. J. Brooke was shot through the heart. Sergt. Major Henry Sleephack was mortally wounded, and died December 27.

The thanks of the President of the United States was tendered Colonel Taylor and the officers, non commissioned officers, and troops of the regular army, for the discipline and bravery displayed by them on the occasion of this battle.

In May, 1838, Companies C, D and E, which had remained until this time at Camp Sabine, La., joined the forces serving in East Florida, and by November the whole of the regiment was in middle Florida under the command of Captain William Hoffman.

On May 2, 1839, Lieut. Wm. Hulbert and several men were waylaid and killed by Indians near Fort Frank Brooke. Company I, under Lieuts. Samuel Woods and L. A. Armistead, had an engagement with the Indians at Fort Andrews on August 29, 1839, in which one sergeant and one private were killed. On July 13, 1840, two men of Company D were killed by Indians near Fort Pleasant.

The Sixth Infantry remained in Florida until after the restoration of peace, when it was sent north on transports via New Orleans, and by March 20, 1842, the entire regiment was again at Jefferson Barracks, Mo. It had left behind,—killed in action, or dead from wounds and diseases,—ten officers and one hundred and twenty-nine enlisted men.

On April 16th the regiment left Jefferson Barracks for Fort Towson, C. N., where the last company arrived May 14.

In July news was received of the death of Gen. Atkinson at Jefferson Barracks, Mo., on June 14, 1842. This distinguished officer had been the colonel of the regiment for more than twenty-six years. He was succeeded by Col. William Davenport, promoted from the First Infantry.

On July 7, 1843, Colonel Davenport effected a transfer of regiments with Colonel and Brevet Brig. Gen. Zachary Taylor. The former returned to the First, and the latter, afterwards the hero of Buena Vista and Monterey and President of the United States, became colonel of the Sixth. General Taylor was then at Fort Smith, Arkansas, in command of the 2d Military Department.

On the regimental return for July, 1844, Brevet 2d Lieut. Winfield S. Hancock is reported as "gained by appointment from the Military Academy."

The declaration of war with Mexico, May 13, 1846, found the headquarters of the Sixth Infantry, Lieut. Col. Loomis commanding, and Companies A, E, G and H, at Fort Gibson; Companies B and C at Fort Towson; I and K at Fort Washita; and D and F at Fort Smith.

General Zachary Taylor, the colonel of the regiment, ceased to be an officer of the Sixth Infantry on June 29, 1846, by his promotion to the grade of major general. He was succeeded by Colonel Newman S. Clarke, promoted from the 8th Infantry.

By July, 1847, the entire regiment, with the exception of Company G

(left at Fort Gibson) and Company I (left at Fort Washita), was at Puebla, Mexico, with the army under General Scott.

Companies G and I remained in the United States during the Mexican War, and should be understood as not included in the strength of the regiment when reference is made thereto in connection with the battles and incidents of this campaign.

The Sixth Infantry left Puebla with General Worth's Division, August 9, and, taking part at Contreras, was before the enemy's works at San Antonio on the 19th, turned his three batteries and was warmly engaged in the battle of Churubusco on the 20th.

To quote from Ripley's History of the Mexican War:

"The Sixth and Fifth Regiments had pushed on along the road in pursuit of the retreating enemy, the Sixth being in advance, as it had formed on the left of the Fifth when the latter had engaged the Mexican flank. Worth moved on with the greater portion of his troops, and overtook the Fifth before it came under fire; but the Sixth, having passed rapidly forward beyond supporting distance, had become warmly engaged, and the battle of Churubusco had commenced

"The army which Santa Anna had led back from San Angel was forming along the river Churubusco, and in the cornfields to its north. * * * Of the guns which Bravo had sent from San Antonio, three had arrived at the *tête du pont*. One thirty-two pounder broke down on the road, and was seized by the Sixth Infantry in its advance. The whole train of ammunition wagons being exceedingly heavy and unwieldy, had stalled on coming to the entrance of the fortification, blocking up the road for a considerable distance in its front, and partially obstructing the fire from the embrasures. * * *

"Santa Anna, assisted by a crowd of general officers, strove to form his line, and with some success; but, while things were in this state the small battalion of the Sixth Infantry came boldly forward, though irregularly and in confusion. The leading companies being gallantly led, from very rashness would, in all probability, have entered the *tête du pont*, had not Rincon's troops opened a terrific fire of cannon and musketry from the convent.

"The distance was great for musketry, being over three hundred and fifty yards; but the Mexican position was elevated, and, with the enormous cartridges furnished to Mexican soldiers, the bullets were easily sent to the road; without accurate aim, it is true, but in heavy rolling volleys, and with deadly force. * * *

"The artillery soon opened, raking the causeway, and, being without support or definite orders, the Sixth staggered for a time, the rear became separated from the front, and the regiment was finally ordered by its major to break, fall back, and reform behind the houses of the village which it had passed in its advance.

"With the exception of a party under Captain Walker, which had extended to the right and remained in the vicinity of the enemy, the regiment obeyed the order; but its advance had a most beneficial effect upon the after events of the action.

* * *

"While these events were taking place, a battalion of the Sixth Infantry had reformed, and soon after was ordered to assault the *tête du pont* directly along the road. Captain Hoffman led it forward with gallant bravery, and officers and men followed nobly.

"But the Mexicans in the work, whose attention had been given to the troops advancing through the corn on either flank, seeing this direct assault, turned all their guns upon it, which, enfilading the road, made dreadful havoc. Some of the men re-

coiled under the stern stroke of the artillery, but the general officers were by their side, and a few words of reproof and encouragement sent them back to their places. With a shout they again followed their officers in the advance, but the direct assault was impracticable and Worth shouted to Hoffman to incline to the right into the corn, to operate with the main body of the division in that quarter. There, next the causeway, the Fifth and Eighth had become engaged. They had advanced on the right of the road, and had been saved much of the loss which had befallen the Sixth. * *

"The battle had raged for more than two hours from the time it was first opened by the Sixth Infantry, when the Mexicans first gave way in front of the American right, and fled through the cornfields in their rear toward the city.

"A party of American troops of different regiments, principally of the Second Artillery and Sixth Infantry, was led on by its officers past the left of the *île du pont*, crossed the river Churubusco, and presented itself in threatening position in rear of the work.

"The other troops came up, those on the right closed in, and, rushing through wet ditches, waist deep, over the parapets and into the work, the American troops carried it in a crowd."

Captains Wm. Hoffman and W. H. T. Walker and 1st Lieut. L. A. Armistead, of the Sixth Infantry, with the colors of the regiment, were among those who rushed forward in the advance and finally carried the *île du pont*.

General Clarke, the colonel of the Sixth, was wounded in this action while in command of the brigade. After Churubusco the Sixth was concentrated at Tacubaya.

On Sept. 8 the brilliant battle of Molino del Rey was fought. The storming party at the Mills was divided into five companies each of one hundred men, the Sixth Infantry under Captain A. Cady, with 2d Lieutenant M. Maloney, 4th Infantry, forming one of them. In describing the attack Ripley says:

"Wright promptly advanced his party in line in the direction indicated.

"Upon nearing the enemy's position, all doubts as to the resistance to be encountered were dispelled at once. The battery whose location had been changed during the night, opened heavily upon the flank of the party with round-shot and grape, cutting down officers and men in frightful rapidity.

"The charge was ordered, and the noble soldiers, bringing down their muskets, rushed straight at the battery.

"Of the fourteen officers who went into action with the command, eleven soon fell dead or disabled and with them a large number of the rank and file. In scattered parties those unhurt kept up the fire, but the command as a body was broken and fell away from the battery.

"The Mexican infantry soldiers rushed forward and reoccupied it. They murdered every wounded man left on the ground except Captain Walker of the Sixth Infantry and one private, both desperately wounded, and both doubtless believed to be dead."

In after years Captain Walker, as a major general in the Confederate army, was killed near Atlanta, July 22, 1864.

To quote from Wilcox's History of the Mexican War:

"The Sixth and Eighth Regiments of Infantry were ordered by General Worth over to the right, and reached the intersection of the roads at the north end of Molino del Rey as the flour mill was being taken. * * * Supported by the 4th, they

formed at the junction of the two roads, and as the enemy again advanced opened an artillery and infantry fire, and repulsed and followed him in the direction of Chapultepec."

The battle of Chapultepec followed on Sept. 13th. To quote from Ripley:

"Worth ordered Colonel Clarke's brigade to advance, and that corps came rapidly forward. Pillow ordered them to be posted on the slope of the hill for shelter. The 8th and 5th and a party of the Sixth went up the ascent. The Sixth was, however, ordered around the northern base of the rock, to cut up the fugitives from the castle; for the Mexican garrison was already shaken by the near approach and many were attempting to make good their escape. The Mexican artillery fire having been silenced, the troops most in advance had only been awaiting the ladders to make the last attack. When they were brought up, parties from different corps, moving quickly forward over the rugged though short space between the crest of the hill and the ditch, leaped in, and at once planted ladders. Lieutenant Armistead, of the storming party, led the way, and as the ladders were raised, Lieutenant Selden first mounted to scale the walls. Chapultepec was captured, and the next day Scott's army entered the City of Mexico."

Lieutenant Armistead of the Sixth Infantry, the first to leap into the ditch, is the same who as a brigadier general in the Confederate army commanded one of the three brigades of Pickett's division in the immortal charge at Gettysburg on July 3, 1863, and led his men through that terrific storm of battle until he fell mortally wounded within the Federal lines.

Of the officers of the Sixth Infantry who took part in the campaign, General Clarke, Major Bonneville, Captain Hoffman, and Lieutenants Bacon, Hendrickson and Buckner, were wounded at Churubusco; Captains Cady and Walker, and Lieut. Ernst were wounded at Molino del Rey; and Lieut. Armistead was wounded at Chapultepec. Lieutenant Ernst died of his wounds in the City of Mexico, on Sept. 22, 1847. Lieutenant Bacon died of his wounds on Oct. 12, 1847. Of the rank and file the regiment lost in killed and wounded at Churubusco ninety-one, at Molino del Rey and Chapultepec seventy-two.

Among the many officers of the Sixth who received brevets for their conduct in this war was 2d Lieut. Winfield S. Hancock, brevetted 1st lieutenant for Contreras and Churubusco. 2d Lieut. Simon B. Buckner, afterwards a lieutenant general in the Confederate service and later Governor of Kentucky, was given the brevets of 1st lieutenant and captain.

After the occupation of the City of Mexico in September, the regiment remained quartered there until January, 1848, when it was moved to Toluca. The month of June found it concentrated at Jalapa, Mexico, preparatory to leaving for the United States, and by July 31, the Sixth, with the exception of Companies G and I at Gibson and Washita where they had remained during the war, was concentrated at Jefferson Barracks awaiting distribution.

December 31 found the headquarters at St. Louis, Mo.; Company D at Jefferson Barracks; Companies A, E and K, at Fort Snelling; B and F at Fort Crawford; C at Fort Atkinson; G and I at Fort Leavenworth, and H at Fort Scott.

On Oct. 1, 1849, Lieut. Winfield S. Hancock was appointed adjutant of the regiment.

The headquarters in October were at Fort Snelling, but returned to St. Louis by Dec. 31, and on May 1, 1851, moved to Jefferson Barracks.

The companies, scattered over the frontier in garrison and in the field and changing from post to post, were stationed during the period from 1851 to 1858, from time to time, at Jefferson Barracks, Forts Gaines, Scott, Snelling, Kearney, Laramie, Atkinson, Dodge, Leavenworth, Riley, Ridgely and Pierre.

On Aug. 29, 1854, Brevet 2d Lieut. J. L. Grattan, 6th Infantry, and thirty men of Company G were killed by Indians near Fort Laramie. The affair is known as the "Grattan Massacre." A party of Mormons en route to Salt Lake City having officially reported to the commanding officer of Fort Laramie that the Sioux had stolen one of their cows and refused to give it up, Lieutenant Grattan was sent with thirty men of Company G and a mountain howitzer to demand restoration of the stolen property. This was the last seen of Grattan and his men alive, and the facts of the massacre as related have been gathered from statements of the Indians. Having reached his destination Lieutenant Grattan made his demand upon the Indians, and then despite their warning trained his howitzer upon them and prepared to fire. The Indians, watching the pulling of the lanyard, avoided the shot by falling to the ground as the piece was discharged, and rushing upon the troops overpowered them and killed every man.

On July 20, 1855, the headquarters were moved from Jefferson Barracks to St. Louis.

On Sept. 3 a battalion of the regiment composed of Companies A, E, H, I and K, under the command of Major Albenmarle Cady, took part in the affair with the Sioux on the Blue Water, known as the battle of Ash Hollow.

Writing to the Adjutant-General from his camp on Blue Water Creek, N. T., under date of September, 1855, General Harney says:

"At half past four o'clock, A. M., I left my camp with Companies A, E, H, I and K, 6th Infantry, under the immediate command of Major Cady of that regiment, and proceeded toward the principal village of the Brules with a view to attacking it openly, in concert with a surprise contemplated through the cavalry. * * *

"The results of the affair were eighty-six killed, five wounded, about seventy women and children captured, fifty mules and ponies taken, besides an indefinite number killed and disabled. The amount of provisions and camp equipage must have comprised nearly all the enemy possessed, for teams have been constantly engaged in bringing into camp everything of value to the troops, and much has been destroyed on the ground.

"The casualties of the command amount to four killed, four severely wounded, and one missing, supposed to be killed or captured by the enemy. * * *

"With regard to the officers and troops of my command I have never seen a finer military spirit displayed generally; and if there has been any material difference in the services they have rendered, it must be measured chiefly by the opportunity they had for distinction.

"Lieutenant Colonel-Cook and Major Cady, commanders of the mounted and foot forces, respectively, carried out my instructions to them with signal alacrity, zeal, and intelligence.

"The company commanders whose position, either in the engagement or in the pursuit, brought them in closest contact with the enemy, were Captain Todd of the

6th Infantry, Captain Steele and Lieutenant Robertson of the 2d Dragoons, and Captain Heath, 10th Infantry. * * *

"Brevet Major Woods, Captain Wharton, and Lieutenant Patterson, of the 6th Infantry, with their companies, rendered effective service as reserves and supports, taking an active share in the combat when circumstances would permit." * * *

Thus Grattan and his men were avenged by their comrades of the Sixth.

General Clarke was relieved from the command of the Department of the West July 1, 1856, and the headquarters of the regiment moved to Jefferson Barracks. They were at Fort Leavenworth Oct. 11th, and on the 14th were at Leecompton, K. T., but by Nov. 25 were again at Fort Leavenworth.

During July and August, 1857, Companies C, D and G, Captain William S. Ketchum commanding, took an active part in the expedition against the Cheyennes commanded by Colonel Sumner, 1st Cavalry, experiencing unusual hardships. On July 6, with six companies of cavalry and four mountain howitzers, with pack mules for transportation, they crossed the Platte River, and proceeded in the direction of the Republican and South Fork. On the 29th the cavalry in advance met a body of some four hundred Indians, and an engagement occurred in which the mounted troops had one killed and seven wounded.

After this affair Company C (Captain R. W. Foote and Lieut. John McCleary) remained with the wounded, sick and disabled, and threw up a breast-work called Fort Floyd.

Companies D and G, Captain William S. Ketchum, 1st Lieutenant William P. Carlin, and 2d Lieutenant Orlando H. Moore, marched with the command in pursuit of the Indians.

The duty required of the companies of the regiment on this campaign, in keeping up and coöperating with the cavalry, was especially trying in its forced marches and privations. Companies C and D in returning suffered particularly. The former left Fort Floyd on August 8, after having been constantly harassed by the Indians, and finally reached Fort Kearney about the 21st, much wearied and broken down, having been out of rations some eighteen days. From August 2d to the 19th Company D had nothing but fresh beef for food, the rations with this exception having become exhausted. The men suffered much, and many were bare-footed, and otherwise destitute of clothing.

In January, 1858, the headquarters, with Companies A, D, E, G, H and K, were at Camp Bateman near Fort Leavenworth, Companies B and C were at Fort Laramie, F at Fort Riley, and I at Fort Kearney.

The Sixth was now preparing for its grand march across the continent from Fort Leavenworth to the Pacific Ocean.

The movement began on March 18, when Companies E and H left Camp Bateman as part of the escort to the supply train for the army in Utah, and the headquarters with Companies A, D, F, G, I and K, arrived at Fort Bridger August 6, where they were joined on the 15th by B and C from Fort Floyd. Companies E and H were relieved from garrison duty at Fort Bridger on the 16th and encamped in the vicinity of the post.

The regiment left camp near Fort Bridger August 21, and arrived at camp near Benicia Barracks, Cal., on November 15, the total distance marched from Fort Bridger to Benicia Barracks having been 1017 miles.

The regiment during this march was under the command of Lieut. Col. George Andrews, with Major Wm. Hoffman, second in command.

From Benicia Barracks the Sixth was distributed among different posts and stations in the Department of the Pacific.

By January, 1859, the headquarters and Companies F and H were at the Presidio, A at Benicia Barracks, B at Fort Humboldt, C and I at Benicia Depot, D at Fort Weller, Cal., E and K at Camp Banning near San Bernardino, Cal., and G at New San Diego, Cal.

On August 5 Captain Lewis A. Armistead with a command consisting of twenty-five men of his own company, F, and twenty-five men of Company I under 1st Lieutenant Elisha G. Marshall, attacked and defeated the Mohave Indians in an engagement near a lagoon twelve miles below Fort Mohave. Over two hundred Indians are supposed to have taken part in the affair and twenty-three were found dead on the field. The only casualties among the troops were three privates of Company I slightly wounded.

In January, 1860, the headquarters and Companies A and H were at Benicia Barracks, B at Fort Humboldt, C, E and F, at Fort Yuma, D at Fort Bragg, and G, I and K, at New San Diego.

Company A, Captain Franklin F. Flint commanding, left Benicia Barracks May 14 and arrived at Truckee River, U. T., three hundred miles distant, on the 31st, and on June 2 had an engagement with the Indians in which one private was severely wounded.

On October 17, 1860, the colonel of the regiment, Brevet Brig. Gen. Newman S. Clarke, died at San Francisco while in command of the department of California. He was succeeded by Colonel Washington Seawell, promoted from the 8th Infantry, who joined the regiment at Benicia Barracks on March 8, 1861.

On April 2, a detachment of thirty enlisted men of Company B, 6th Infantry, under the command of 1st Lieut. Joseph B. Collins, 4th Infantry, left Fort Humboldt, on a scout in the Bald Hills, Cal. They were engaged with the "hostiles" on the 14th and 15th near Mad River, about fifty miles from the post.

The Indians lost on the first day between fifteen and twenty killed, and on the second day five killed and three wounded. The only casualty among the troops was one man wounded.

The great War of the Rebellion was now in progress, and the summons had crossed the continent for the Sixth to hurry eastward. Several of its best and bravest officers, honest in a mistaken construction of the Constitution and true to their convictions as to duty under it, had tendered their resignations and given themselves to the fatal cause. But the rank and file with unhesitating fealty stood by the old flag, and remained, to a man, on the side of the North.

The movement began October 31, 1861, and by January 31, 1862, the entire regiment was concentrated at Washington under the command of its colonel.

Colonel Seawell retired from active service February 20, 1862, and was succeeded by Colonel Electus Backus, promoted from the 3d Infantry, who died at Detroit, Mich., on June 7, 1862, and was in turn succeeded by Col. Hannibal Day, promoted from the 2d Infantry.

The regiment left Washington City on March 10, 1862, for service in the field, as part of Sykes' Brigade of Regulars, and participated in the siege and the operations which preceded the evacuation of Yorktown by the enemy on May 4.

The regiment was mainly employed on picket duty along the Chickahominy until June 26, when it was sent to reinforce a portion of McCall's Division of Fitz John Porter's Corps which was engaged with the enemy at Mechanicsville. It arrived close to the scene of conflict late in the evening, but took no part in the action, and the next morning was ordered to fall back towards Gaines' Mill and await the attack of the enemy, who was advancing in force. The battle commenced about noon on the 27th.

During the earlier stages the 5th New York and a South Carolina regiment had repeatedly attacked each other to no purpose. Colonel Warren about 3 o'clock in the afternoon asked the division commander for the Sixth Infantry, and formed it in front of and perpendicular to the line of the 5th New York and 17th Infantry, facing the open space over which the former and the South Carolina regiment had been charging and countercharging. The arrangement was that the 5th New York should repeat its charge, and on being countercharged the Sixth was to take the Confederate regiment in flank. The Sixth Infantry had hardly taken position when those in command saw the uselessness of such work, which, according to Warren's graphic words, was "only covering the ground with dead men," and the regiment received orders simply to hold its position in the woods, which it did until about sunset, when the Federal lines, flanked at both extremities, gave way.

As the regiment's position was in advance of the first line and in the woods, the status of affairs was not at once apparent, but a few moments under heavy canister fire sufficed to clear up matters, and, crossing a small bridge, the Sixth in disarray passed to the rear between two of the enemy's skirmish lines, and reformed on the ridge occupied by Generals French and Meagher.

Later in the evening the regiment moved into the valley of the Chickahominy, and early on the morning of the 28th crossed that stream. The bridge was destroyed after the passage of the Sixth Infantry, the last troops to leave the field.

In this action Captain R. W. Foote was killed, and Lieutenants H. A. F. Worth and D. D. Lynn were wounded. Captain Thomas Hendrickson, commanding the regiment, had his horse killed under him. Of the enlisted men five were killed and sixty-one wounded.

During the day 2d Lieutenant Jeremiah P. Schindel, while separated from the regiment with a few men, exhibited personal bravery and coolness under fire to a marked degree.

The regiment arrived at Manassas via Warrenton Junction August 20th, and participated in the second battle of Bull Run on the 30th. It occu-

pied a position about the centre of the line, near the Warrenton Turnpike, from early in the forenoon until near five o'clock, P. M., and falling back with the army bivouacked that night at Centerville.

Six enlisted men of the regiment were killed in this battle; and Lieutenants C. M. Pyne, A. W. Bickley, and J. P. Schindel, and twenty-five enlisted men, were wounded.

During the battle of Antietam, September 17, the Sixth was on picket duty, and on the 19th the regiment proceeded to Nolan's Ford on the Potomac near Sharpsburg, crossed into Virginia, and had a skirmish with the enemy on the 20th, and, finding him in force, re-crossed in obedience to orders and encamped at Sharpsburg, Md.

The regiment took part in several reconnoissances in October, November and December, and on December 11 bivouacked on a ridge on the north bank of the Rappahannock, overlooking the valley and city of Fredericksburg.

Crossing with Hooker's division on the 13th, the regiment was moved forward to within a few hundred yards of the famous stone wall for the purpose of attacking on the morning of the 14th. The plan being changed, the Sixth held its position in the line on the same ground during the whole of the 14th, Sunday, under a most galling fire without having a chance to make an appreciable return. Between 11 and 12 o'clock P. M. the line was withdrawn into the town, and occupied the main street during the 15th exposed to some artillery fire. About 9 o'clock P. M. the division of which the Sixth formed a part was moved nearer the outskirts of the town, where it remained till next morning, when in a fog and rain the regiment re-crossed the Rappahannock, following the First Brigade. The ground in front of Company E was so flat that in the course of the day 1st Sergeant Thetard—afterwards mortally wounded at Gettysburg—was struck, and Corporal Kelley and five other men were picked off in succession. Having re-crossed the river the regiment during the day and night reoccupied with its division the bivouac on the ridge north of and overlooking the city, and on the 17th returned to camp near Potomac Creek.

At Fredericksburg five enlisted men were killed, and 2d Lieutenant James McKim and twenty enlisted men were wounded.

The regiment left camp near Potomac Creek April 27, 1863, and proceeded to Harwood Church, on the Fredericksburg-Warrenton road, crossed the Rappahannock at Kelly's Ford on the 29th, and after dark on the same day waded the Rapidan at Ely's Ford and bivouacked on its right bank. On the 30th the Sixth marched with its division to Chancellorsville, and after a short halt moved out on the Fredericksburg road for about three-quarters of a mile and bivouacked for the night.

In the forenoon of May 1 the Second Brigade was formed on the edge of the Wilderness, with the 2d and 6th Infantry on the right of the road. The line, only part of the time covered by skirmishers, rapidly advanced, brushing away the Confederate force in front, which precipitately retreated, but re-formed while the Federals halted, and opened a fire from which the 2d and 6th Infantry particularly suffered. Being finally outflanked, the line was withdrawn, and on reaching the ground where it had formed in the morning, the Sixth was detached to cover the exposed flank until re-

lieved. General Hancock's skirmishers soon coming up, the regiment re-joined the brigade, which had reached the ground of the previous night's bivouac.

The casualties to the regiment in this action were confined to the enlisted men, one being killed and twenty-three wounded.

On the 3d, while on picket in the vicinity of Chancellorsville, the regiment captured four of the enemy, and while engaged in a skirmish two enlisted men were wounded.

On the morning of the 6th the regiment retreated with the army towards the Rappahannock, re-crossed at the U. S. Ford, and arrived after a hard march of sixteen miles at the old camp on Potomac Creek, near Falmouth.

The regiment left camp on Potomac Creek, June 4, for Benson's Mills where it remained until the 13th, when it took up the march for Aldie, Va., arriving at that point on the 22d. It left Aldie on the 27th, crossed the Potomac at Edwards' Ferry on the same day, and marching with but little intermission until the 30th, arrived at Unionville, Md.

At Frederick the Sixth Infantry was transferred from the Second to the First Regular Brigade of Sykes' Division, under its colonel, Hannibal Day, as brigade commander.

Moving into Pennsylvania, the regiment by dawn of July 2 was in position on the extreme right of the Union line, not far from the Baltimore and Gettysburg Turnpike.

About the middle of the forenoon it was placed as reserve near the centre of the line, and during the afternoon was moved in haste to the left and down the rugged slopes with the regular brigades. The Second penetrated the woods and wheat field in front, while the First, to which the Sixth Infantry belonged, held the open ground immediately in its rear. The left being in the air and the troops on the right having given way the division was ordered to fall back.

The regular infantry, which included the Sixth, was then formed in the woods back of Little Round Top and remained there during the 3d, exposed to the fire of artillery and to that of sharpshooters who were hidden among the rocks in and around the "Devil's Den."

On the morning of the 4th the First Regular Brigade was ordered towards the Emmetsburg Turnpike, to "feel" the enemy. It advanced with the 3d, 4th and 6th Infantry in line, the Sixth on the left, to the edge of Durfee's peach orchard, which was entered by the skirmishers. The brigade then moved back to Little Round Top, but was immediately faced about with orders to picket the "Devil's Den" and outer edge of the woods in front of the line. The Confederate outposts were in close proximity, and the picket firing which soon began was continued until dark.

On the morning of the 5th, part of the picket line, including Company I, 6th Infantry, was advanced beyond the Emmetsburg road. In the afternoon the brigade returned to its position in the woods in front of Round Top, and by 5 o'clock was with the division in pursuit of the enemy, bivouacking that night about four miles from Emmetsburg.

The casualties to the regiment at Gettysburg were 1st Sergeant I.

Thetard, Company E, and seven privates killed; 2d Lieutenant Thomas Britton, eight non-commissioned officers and thirty privates wounded.

Lieutenant Britton's wound was received under circumstances which especially distinguished him for bravery.

The regiment was lying down exposed to a telling fire from Confederate sharpshooters, when, to steady the growing uneasiness of his men, he deliberately rose in the line of file closers, stretched and yawned as though waking from a nap, and coolly walked back and forth the length of the company.

On the 1st of August 1863 Colonel Day was retired from active service and was succeeded by Col. E. A. King, promoted from the 19th Infantry; but on the 20th of September,—less than two months later,—Colonel King was killed at the battle of Chickamauga while in command of a brigade of Thomas' Corps. He was succeeded by Colonel J. D. Greene, promoted from the 17th Infantry.

On August 16, 1863, the regiment, under the command of Captain Montgomery Bryant, embarked for New York City, where it arrived on the 21st and camped in Washington Park. It had been sent there on account of the draft riots, and remained doing provost duty until the 11th, when it was transferred to Fort Hamilton, N. Y. H.

While at Fort Hamilton the regiment was consolidated into two companies,—H and I,—and drilled as heavy artillery, to form part of the defenses of New York City. On May 17, 1865, the regiment embarked on the steamer *Star of the South* for Savannah, Ga., where it arrived on the 21st and was assigned to duty as part of the forces of the District of Savannah with headquarters at Hilton Head.

The regiment,—with the exception of Companies B and I on detached service at Lawtonville, S. C., since September,—arrived at Charleston, S. C., from Hilton Head on December 9, 1865, and took quarters in the "Citadel."

During February skeleton Companies A, C, E and F, were recruited from the depot, completing the original organization of the regiment.

While the headquarters remained at Charleston the companies were moved from place to place in South Carolina, being stationed from time to time at Charleston, Georgetown, Aiken, Beaufort, Darlington, Orangeburg, Lawtonville, Columbia, Strawberry Station, and other points.

On June 25, 1867, Col. Greene resigned from the Army, and was succeeded by Colonel De L. Floyd-Jones, promoted from the 19th Infantry. In the same year regimental headquarters, with Companies C, D, E and F, were transferred to the Indian Territory.

In the reduction of the army under the act of Congress approved March 3, 1869, the Sixth was reorganized by consolidation with the 42d Regiment of Infantry, and on March 15, 1869, Colonel Floyd-Jones was transferred to the unassigned list and Bvt. Maj. Gen. Wm. B. Hazen became colonel of the regiment by transfer from the 38th Infantry.

Companies A, B, G, H, I and K, which had continued on duty in the South, arrived at Fort Gibson March 17th, where they were joined in May by headquarters from Fort Arbuckle.

January, 1872, found the headquarters and Companies A, G and I, at

Fort Hays, Companies B, C, H and K, at Camp Supply, D at Fort Larned, and E and F, at Fort Dodge.

Since leaving the South the companies of the regiment had been employed in marching from place to place, and performing the duties incident to service on the frontier in those days, and had taken part in the settlement of the "Neutral Lands" trouble in Kansas. General Hazen, the colonel of the regiment, commanded the District of the lower Arkansas, which included the disturbed section, from August to December, 1869.

Company I was at Chicago from October 13 to 24, 1871, sent there for service during the great fire.

In May and June, 1872, the regiment was transferred to the Department of the Dakota, the last company reaching its station June 21.

Companies B and C were present during the skirmishing between the "hostiles" and the garrison of Fort A. Lincoln on the 2d and 18th of October, 1872.

The limited space allowed this sketch will not admit following the companies of the regiment in detail through their arduous and varied service in the Department of Dakota.

The Sixth furnished troops to escort the engineers of the Northern Pacific Railway from time to time, for duty in connection with the Yellowstone expedition of 1873, as escort for the commission surveying the northern boundary in 1874, and for the exploration of the Yellowstone River in 1875; and took an active part in the Sioux campaign of 1876. In the last case a battalion of the regiment consisting of Companies B, C, D and I, under Major Orlando H. Moore, formed a part of General Terry's column operating against the "hostiles," during May, June, July, August, and September.

On August 21, 1876, Company G, 1st Lieutenant Nelson Bronson commanding, left Fort Buford as guard for the steamers *Josephine* and *Yellowstone*. While running about fifty yards from the bank at a point on the Yellowstone some forty miles below Glendive Creek, the boat carrying Lieutenant Bronson and his men was suddenly fired upon, by Indians concealed in the timber and dense undergrowth. Private Dennis Shields was shot through the left breast and instantly killed. The fire was promptly returned, but on account of the retreat of the Indians and the nature of the country nothing more could be done, and the steamer continued on her way.

In June, 1880, the Sixth Infantry was relieved from duty in the Department of Dakota, and ordered to proceed to White River, Col., and at the muster of June 30 in camp on Snake River, Wyo., the colonel, lieutenant-colonel, major, and all the companies were present.

Major Orlando H. Moore and Companies D and I were left at Snake River, while the remainder of the regiment continued the march, arriving at camp on White River July 7.

On December 15, 1880, General Hazen was appointed chief signal officer of the army and was succeeded by Bvt. Maj. Gen. A. McD. McCook, promoted from the 9th Infantry.

On May 13, 1881, Companies D, F, G and H, under Capt. H. S. Hawkins, formed the infantry battalion with General Mackenzie's Expedition in south

western Colorado. The battalion marched to the junction of the Grand and Gunnison rivers via Cantonment Uncompahgre, and returning to Gunnison City, Col., was sent by rail via Cheyenne, Wyo., to Park City, Utah, en route to the junction of the Greene and Duchesne rivers in eastern Utah, where it arrived September 17 and commenced building a post called Fort Thornburgh.

The entire regiment had in the meantime been ordered to the Department of the Platte.

In May, 1883, the entire regiment was concentrated at Fort Douglas, Utah.

In May, 1886, General McCook was made Commandant of the U. S. Infantry and Cavalry School, and the headquarters were sent to Fort Leavenworth, Kans., where they arrived on the 15th.

Companies H and I left Fort Douglas on July 1 and joined the headquarters at Fort Leavenworth on the 4th.

Companies A, B, C, D, E, F, G and K remained under the command of Lieut.-Col. Nathan W. Osborne, 6th Infantry.

On November 5, Companies F and K left Fort Douglas for the site of the new post near Chicago, Ill., and, under the command of Major and Brevet Lieut.-Col. William J. Lyster, established a camp on the military reservation in the Highlands where Fort Sheridan is now situated.

On July 11, 1890, General McCook was appointed brigadier-general, and was succeeded by Col. Melville A. Cochran, promoted from the 5th Infantry.

On July 21, orders were issued from the War Department skeletonizing Companies I and K by transferring the enlisted men to other companies of the regiment.

On August 19, the headquarters and Company G left Fort Leavenworth for the new post near Newport, Kentucky, now known as Fort Thomas, where they arrived on the 20th and joined Company F from Fort Sheridan.

Colonel Cochran assumed command of the regiment at Fort Thomas on the 22d.

November 1, 1892, the date of this sketch, finds the Sixth Infantry in its eighty-fifth year, under the command of Col. Melville A. Cochran, with headquarters, skeleton Companies I and K, and Companies B, C, D, F, G and H, at Fort Thomas, Ky.; Company A at Fort Wood, N. Y. H.; and Company E at Newport Barracks, Kentucky.

Note.—The writer is under obligations to Lieut.-Col. Robert H. Hall, 6th Infantry, for much information as to the original organization of the regiment; to Capt. Jeremiah P. Schindel, 6th Infantry, for a great deal concerning the late war; to 1st Lieut. Benjamin W. Atkinson, 6th Infantry, for the use of his private scrap books containing autograph letters of his grandfather, Gen. Henry Atkinson, and interesting memoranda; and to Sergt.-Maj. Charles H. Devereaux, 6th Infantry, for his excellent, painstaking work in collecting and extracting valuable matter from the regimental records, of which in his present position he has been immediate custodian for more than eighteen years.

THE EIGHTH REGIMENT OF INFANTRY.*

BY LIEUTENANT RICHARD H. WILSON, ADJUTANT 8TH U. S. INFANTRY.

THE Eighth Regiment of Infantry was organized under the immediate supervision of its colonel—William J. Worth—who established the first regimental headquarters at West Troy, N. Y., in July, 1838. On the 31st they were removed to Madison Barracks, N. Y., at which place all the companies of the regiment were concentrated by the 31st of October.

The regiment was raised under Act of July 5, 1838, and the U. S. Army Register of date September 1, 1838, gives its commissioned roster as follows:

Colonel Wm. J. Worth, Lieutenant-Colonel N. S. Clarke, and Major E. A. Hitchcock.

Captains Thomas Staniford, T. P. Gwynne, J. A. Phillips, St. Clair Denny, George Wright, J. S. Worth, E. B. Birdsall, Joseph Bonnell, W. R. Montgomery, and R. B. Screven.

First Lieutenants Wm. O. Kello, E. A. Ogden, J. M. Hill, C. C. Daveiss, Henry McKavett, J. V. Bomford, Thomas Johns, C. R. Gates, Larkin Smith and J. H. Whipple.

Second Lieutenants J. M. Harvie, J. T. Sprague, Lucius O'Brien, George Lincoln, Wm. C. Browne, J. A. Riell, A. L. Sheppard, Wm. B. Hayward, Joseph Selden, and T. S. J. Johnson.

During the years 1837-38 a very unsettled state of affairs existed in Canada, caused by the efforts of an insurrectionary party known as the "Patriots" to establish there a constitutional government which should be responsible to the people. This movement found many friends on our side of the border, who were so open in their efforts to give aid and comfort to the "Patriots," that a serious rupture between the United States and Great Britain seemed imminent. During this disturbed condition of affairs, to prevent aggressions from our side and to protect our vessels navigating the St. Lawrence, detachments of the regiment were carried on all passenger steamers. This duty and the constant patrol service called for by its position as international peacemaker along the inhospitable Canadian border, kept the regiment on the northern border of New York State until 1840 (April 13) when it was ordered to report to General Atkinson at Fort Winnebago, Wisconsin Territory, to take part in the operations against the Winnebago Indians, who had left their reservations and were committing depredations to an alarming extent. At this time Companies E and H had been broken up and consequently did not accompany the regiment.

Starting from Sacket's Harbor, May 2, the trip to Fort Howard at the head of Green Bay, Mich., was made by steamer through Lakes Ontario,

* An abridgment of Lieut. Wilson's "History of the Eighth U. S. Infantry."

Erie, Huron and Michigan, except the short march from Lewiston, N. Y., to Buffalo, N. Y. Fort Howard was reached May 10, and by May 28 the regiment was occupying Camp McKeown near Fort Winnebago. While here the negotiations relative to the removal of the Winnebagoes west of the Mississippi were satisfactorily concluded, and the entire nation embarked in canoes about the middle of June for their new homes.

The Winnebago enterprise having been satisfactorily settled, the regiment was sent to Jefferson Barracks, where it remained but a short time, leaving for Florida, September 24, 1840, where it was to spend the next four years in most arduous service. The transfer of the eight companies was made under Lieutenant-Colonel Clarke, by steamer down the Mississippi and to Tampa Bay by sailing vessels, thence by marching to Fort King (November 5th) to which station Colonel Worth had brought the reorganized Companies E and H, October 31st. After a short stay at Fort King the regiment (December 2, 1840), took station at Fort Brooke, Tampa Bay.

During the year 1841 the various companies of the regiment made many marches and scouts, traversing the entire theatre of operations in every direction. Colonel Worth, although commanding the "Army of Florida" from May 31, 1841, to July 15, 1842, and subsequently "Military Department No. 3," retained command of his regiment during his entire stay in Florida.

Companies A, E and G were at Camp Hospitarke near Fort Deynaud in September when the officer in command, Captain Gwynne, received word that the artful old Seminole chief Hospitarke, who had outwitted every commanding general from Gaines to Armistead, was in the vicinity and desirous of having a talk. This information was sent to Colonel Worth who at once came over from Tampa bringing with him another noted chief, Coacooche (who had been captured some time before), to assist in the enterprise of capturing Hospitarke. The outlaw and 17 of his young men fell into an ambush skilfully devised, surrendered at discretion, and in a short time was on his way to his new home in Arkansas.

At the end of September, 1841, A, C, E and G were at Punta Rassa where, owing to the fact that at certain periods during great storms the land was subject to overflow from the waters of the Gulf, platforms were erected sufficiently high it was supposed for protection, on which were pitched the tents of officers and men. On the night of October 10th a terrific storm arose which soon grew to a tornado, and at dawn of the next day all that could be seen of the cheerful, busy camp of the day before were the up-rights and roofs of the hospital. In the branches of two large, moss-mantled live-oaks which stood in the centre of what was once Camp Caloosahatchie were clustered, close as spines upon the prickly pear, all the men of the command,—some 200,—who, true to their teachings, had clung to their arms through all these trying hours, and not one had perished.

The Big Cypress expedition of the winter of 1841-42 kept the regiment continually upon the move from November, 1841, till February, 1842. This expedition, though not sanguinary, produced good results. Villages and corn fields were given to the flames. Bands of men, women and children were driven from swamp to swamp and from island to island, until, in the

words of one of their chiefs, they could find no safe place in which to rest their weary heads; so in broken and scattered bands they fled their native wilds; delivered themselves up at Fort Brooke, until only Billy Bowlegs and Sam Jones with a handful of warriors and their families were left to represent what, but a few years before, had been an Indian nation.

The activity of the scouting parties was not diminished, however, until the 14th of August, 1842, when Colonel Worth, from his headquarters at Cedar Keys, announced the termination of the war with the Seminole Indians which is estimated to have cost the United States 2000 lives and \$20,000,000. Colonel Worth assigned certain lands to the remaining Indians for hunting and planting purposes, and immediately set about redistributing the troops of his command in more healthful and accessible stations.

Although the war had ended the companies of the regiment appear to have been ever on the move from station to station during the year 1843 though more quietly at their posts in 1844 and 1845.

In the latter year it became apparent that peaceful relations with the Republic of Mexico could not be maintained much longer, and the 8th Infantry received orders in the early fall to join General Taylor's "Army of Occupation" in Texas.

From the mouth of the Nueces, a tributary of Corpus Christi Bay, stretches a bleak sandy plain for two miles to the southeast, dotted here and there with scrub live-oaks and dwarf mesquite, terminating at a bare bluff or ridge under which in those days slept the village, hamlet, town, or ranch, of Corpus Christi, the most murderous, thieving, gambling, cut-throat, God-forsaken hole in the "Lone Star State" or out of it. This stretch of plain was the camping ground of the Army of Occupation from August, 1845, until March, 1846. Here the regiment joined the army, then consisting of five regiments of infantry, one regiment of dragoons, and Ringgold's "Flying Artillery,"—the largest force of troops of the regular army that had been assembled up to that time, amounting to nearly 5000 men.

By the middle of October, 1845, all the companies were again united and the regiment was ready for the Mexican War, in which it was second to none in the performance of distinguished services. It was placed in the First (Worth's) Brigade, and was under the command of Major Belknap, and at the beginning of the campaign in Northern Mexico it numbered 20 officers and 394 men.

Early in 1846 the news of the annexation of Texas to the United States was received, and on the 9th of March General Taylor took up his march to the Rio Grande, reaching that river opposite Matamoras March 28th.

The army immediately set about strengthening its camp, and during this time an event occurred which threw a gloom over the whole army. Colonel Worth had had a controversy with Colonel Twiggs several months before as to their respective rights to command,—Colonel Worth claiming seniority by virtue of his rank in the line, and Colonel Twiggs by virtue of his brevet rank. The claim of the latter having been sustained by President Polk, Colonel Worth at once, in disregard of the earnest appeals of General Taylor, Major Belknap, and his host of friends, tendered his resignation

and, by the advice of General Taylor, accompanied it to Washington. The regiment was paraded April 23 to bid farewell to its colonel. Major Belknap succeeded him in the command of the First Brigade, and Captain W. R. Montgomery took command of the regiment.

Fearing for the safety of his depot at Point Isabel, General Taylor moved his army there, except a small force under Major Brown in the field-work opposite Matamoras, and spent several days in completing its defenses, during which time the Mexicans cannonaded the troops left behind. On the 7th, at 3 P. M., he began the return, having in his front an army of 8000 men, his own force numbering less than 2500. The two armies came in contact at about 2 P. M., May 8, 1846, and the battle of Palo Alto ensued, the first battle in which the Eighth Infantry was engaged as a regiment.

The regiment occupied its several positions during the day without firing a shot, although it lost four killed and 14 wounded, about one-third of all the casualties. The action in fact was a defensive one on the part of the Americans, and was fought mainly by artillery against Mexican artillery and cavalry, supported by infantry. To the American infantry it was most trying and unsatisfactory, subjected as they were to the artillery fire for hours without the possibility of replying to it. At daybreak on the 9th the two armies were in sight of each other, but before daylight the enemy could be seen moving. He fell back to the Resaca de la Palma, which was a ravine six or eight feet deep and 50 yards wide, with thick woods bordering its margin. The Mexican line formed a crescent along it for a mile on the right and left of the road leading to Matamoras.

The American army began its pursuit at an early hour, moving from the right and thus bringing the Eighth in the rear of the column, and at the beginning of the battle it was held in reserve, but later, as the regiment in its advance came near General Taylor, Captain May reported that he had run around the Mexican battery in the centre of their line but could not hold the guns. General Taylor immediately turned to Major Belknap and gave him the following memorable order, "Charge in there, Colonel Belknap, and take those guns and keep them."

The regiment was quickly deployed in an open space on the left of the road, and, accompanied by a part of the 5th Infantry, charged into the ravine and up on the other side of it. The Mexican regiments at this point were the Lapadores and the Tampico Guards, two of the best in their army. These troops defended their guns with special determination, and a hand-to-hand bayonet conflict followed, in which most of the Mexican force was either killed, wounded or taken prisoners. All seven of the guns were taken. The total loss of the regiment was one officer and nine men killed, and seven officers and 26 men wounded. After this second defeat the Mexicans abandoned all hope of defending the line of the Rio Grande, and General Taylor occupied Matamoras on May 18th.

While here, owing to the depletion of Companies C, F, G and K, they were broken up, and the enlisted men, except the 1st sergeants, assigned to the remaining companies of the regiment.

The President having declined to accept the resignation of Colonel

Worth, he returned to the army and assumed command of the First Brigade, May 29th.

During the advance upon Monterey, divisional organization of the army was effected, the Eighth being placed in the Second Division, still under Colonel Worth. Lieutenant-Colonel Staniford assumed command of the regiment, August 30, at Cerralvo, and on September 14, the division left that place, encamping at Walnut Springs, three miles northeast of Monterey, on the 19th.

The 2d Division left its camp at 2 P. M., September 20, to cut the enemy's line of retreat by the Saltillo road. No opposition was offered on the 20th, but on the morning of the 21st, Companies A and B under Captain Screven being among the skirmishers covering the front of the division, a body of cavalry about 450 strong charged upon the advance and were hotly engaged near three-fourths of an hour, when they were driven back and entirely dispersed, the Eighth meeting with no loss. The Saltillo road was reached and held, but in taking up a position for the night Captain McKavett and one man were wounded. The report of Colonel Staniford as to the succeeding operations is as follows:

"Early on the morning of the 22d, Companies A, B and D, of the regiment, commanded by Captain Screven, were detached and ordered to join three companies of the Artillery Battalion, all under the command of Brevet Lieutenant-Colonel T. Childs, for the assault of the fortified height on the left of the Saltillo road, commanding at once this road, the strongly fortified Bishop's Palace, and the entire city of Monterey.

"Soon after, an engagement commenced between this command and the enemy on the height, when I was ordered with the remaining companies of the Eighth, commanded by Captain Bomford, Lieutenants Shepherd and Selden, to hasten to the support of Colonel Childs. On reaching the height, I found the enemy driven from it, and Company A, commanded by Lieutenant Longstreet, Company B by Lieutenant Holloway, with two companies of the Artillery Battalion and a part of Colonel Hays' regiment of Texas rangers under command of Captain Vinton, composing the advance of Colonel Childs' command, still engaged with the enemy, driving them towards the Bishop's Palace. A while after reaching the summit of the height, Company H, commanded by Captain Bomford, was thrown in advance to relieve Company A, and the action was kept up by the companies of the Eighth named, companies of the Artillery Battalion, companies of the 5th Infantry, a party of Texas Rangers, and a howitzer commanded by Lieutenant Roland, which was brought on the height, until about 3 o'clock, when the enemy appeared in force in front of Captain Vinton's command; they were met by him, repulsed and driven in confusion from the Palace, which resulted in the capture of three pieces of artillery,—one 12-pdr. one 6-pdr and one howitzer.

"During this engagement the regiment lost in killed one private; one officer (Lieutenant Wainright) and two non-commissioned officers wounded; and it is but justice to add that the conduct of both officers and men was worthy of the highest praise, more particularly that of Captain Vinton, Lieutenants Roland, Longstreet and Wainwright, for the zeal and ability with which they discharged their duties.

"About 12 M. on the 23d, Captain Screven, with three companies of the regiment, commanded by Captain Bomford, Lieutenants Selden and Holloway, was detached and ordered to advance by one of the streets leading into the city, in which movement the companies shortly after passing its exterior limits, were deployed as skirmishers and in this order advanced as well as possible over and around numerous high stone enclosures and took undisputed possession of a cemetery, the walls of which were pierced

with numerous loop-holes and otherwise prepared for defense, but was vacated when our forces came in possession of the palace, it being in range of the guns of that position.

"Immediately succeeding the departure of Captain Screven, Companies A and E were detached and directed to follow, leaving Company D with the headquarters of the regiment at the palace. Company E joined Captain Screven at the cemetery and was then ordered to support a piece of artillery under the command of Lieutenant J. G. Martin, 1st Artillery.

"Companies H and B being left as a reserve on the plaza, he then proceeded in column up the street with the remaining companies and a piece of artillery supported as above stated. After advancing a short distance the enemy was reported in front, the piece was placed in battery and immediately received a galling fire from the enemy which was promptly returned; the piece was soon ordered off and the action was continued some distance up the street, by Company H on the right and E on the left; when Captain Bomford with a party was detached and employed with mattocks in making openings through the walls, and thus the troops were enabled to proceed from point to point until the extremity of the square was gained, and they might have entered the next street. Night, however, closing in, the firing ceased, and the command having been joined by Company A, which up to this time was engaged in another part of the town, with the command of Captain Miles, 7th Infantry, in similar operations, the whole depth of the square was taken possession of and retained during the night.

"The next morning, when operations were about being recommenced, a cessation of hostilities was announced. During the action of the 23d three privates of the regiment were wounded.

"In closing this report, it is in justice to the officers and men of the regiment added, that their conduct was marked by a high order of zeal and gallantry in the discharge of their duties."

At the battle of Monterey the strength of the 8th Infantry was 16 officers and 321 men.

The movement from Monterey to join General Scott at Vera Cruz began January 10, 1847, and the six companies of the regiment, now under Captain George Wright, embarked at Brazos February 6, and landed on the Island of Sacrificios, three miles from the Castle of San Juan de Uloa March 9th.

The siege of Vera Cruz was almost wholly a bombardment and the duty of the infantry mainly that of guarding the trenches. The city and castle surrendered March 28th, and Colonel Worth was made commandant and governor of the city.

Company C was reorganized, mainly with recruits, March 18th, and placed on duty with the regiment.

Headquarters with Companies A, B, C, D, E, H and I, left the encampment near Vera Cruz April 13th, for the advance upon the City of Mexico. The regiment was not directly engaged with the enemy at Cerro Gordo, but, after the surrender, was ordered from the position which it had gained on the National Road in rear of Cerro Gordo, to take charge of and guard the prisoners. They were paroled April 18th, and the regiment, resuming the march, reached Puebla May 15th.

Here the reorganized companies—F, G and K—reported August 6th, but on the 7th Company G was again broken up and its men transferred to the other companies.

In the general advance upon the City of Mexico after a long halt at Puebla, the nine companies of the Eighth left that city on the 9th of August. Although they were the first troops to enter the Valley of Mexico, they were not actually engaged with the enemy at the battle of Contreras, August 19th.

The next day the enemy made a stand at Churubusco, six miles from the capital. The storming of Churubusco was perhaps the most brilliant exploit in a war abounding in splendid feats of arms, and the Eighth Infantry was a conspicuous participant in it. The attack was begun by the 6th Infantry without a reconnoissance and with only partial information of the enemy's position. The Fifth and Eighth were brought up to reinforce the advance, and the forward movement was made as rapidly as possible, but being over ditches filled with water and fields of full-grown corn, was attended with some confusion. Reaching a point about 150 yards from the *tête-du-pont* the fire became so severe that the line was staggered and for a moment absolutely halted. Seeing this, Captain Bomford urged his company (H) with the colors from the regimental line. This company, led by himself and Lieutenant Longstreet, hurried forward and when near the ditch the color-bearer fell. Captain Bomford now took the colors and carried them to the ditch, where he left them with Lieutenant Longstreet, and worked his way through the moat. When on the side next the wall the adjutant threw the colors to the captain and hurriedly crossed the ditch followed by Lieutenants Pickett and Snelling and Company H, immediately behind which came the rest of the regiment. Several attempts were now made to get into the fort, and in so doing the flag was passed from one to another as the chances for an entrance seemed good, until at last Captain Bomford, by placing his feet on the shoulders of some of his men, climbed into the work through the embrasure, dragging the colors with him, and in the shortest space of time the other officers above mentioned, with the balance of the regiment and other troops followed. Thus the Eighth Infantry was the first of the army to occupy the work, and its regimental colors the first American flag on the fortress. The loss of the regiment in this assault was seven enlisted men killed and Lieutenant Holloway and 33 men wounded.

Notwithstanding the hard service already performed by the regiment and its depleted condition, it gallantly pushed forward at the head of the 1st Division, reaching Tacubaya on the day following the battle of Churubusco, and was among the first in the engagement of Molino del Rey on the 8th of September.

Here the regiment,—under Major Waite, succeeded by Captain Montgomery,—performed very conspicuous and meritorious service during the entire battle. At daylight September 8, it was formed in line of battle on the extreme left, opposed to the enemy's right which was strongly intrenched. The enemy was driven from his works but made a gallant though unsuccessful attempt to recover his lost position, approaching within 50 paces of the American line but then breaking and taking refuge under the walls of Chapultepec.

The regiment then took a secure position in rear of Chapultepec where

it remained until the killed and wounded were collected, when it was ordered to assist in their conveyance from the field. This being done the regiment marched to and resumed its quarters, but more than one-third of the gallant men who had participated in the action were missing. Three color-bearers were killed in quick succession and the fourth wounded; the fifth bore them gallantly through the action. The regiment went into action with 425 muskets and came out with 284, having had 27 men killed on the field, and ten officers and 111 men wounded.

The assaulting column in another part of the field was drawn from all the regiments of the 1st Division, and the contingent of the 8th Infantry formed the fifth company and was commanded by Captain Bomford with Lieutenant Snelling. All the enemy's positions in front of this column were finally carried and the party remained in possession of the field for a short time, after which the survivors rejoined their respective regiments. The loss of this command was four-fifths of its officers and nearly one-half of the enlisted men.

The regiment was left out of the attacking party on the 12th of September on account of its severe losses and fatiguing duties, but on the 13th it marched with its division to assault the fortress of Chapultepec. It charged up the hill at double time to the enemy's walls, and then forward with other forces into the works, driving the garrison over the walls or taking them prisoners. Lieutenant Pickett took charge of the regimental colors after Lieutenant Longstreet was wounded, had them carried to the top of the castle, lowered the enemy's standard and replaced it with that of the 8th Infantry and the national colors while the battle was yet raging beneath. The regiment took part in the advance of the 1st Division along the San Cosme causeway and finally reached the Garita de San Cosme by cutting through walls and advancing on the tops of houses. The loss of the regiment at Chapultepec and the San Cosme gate was six men killed, and Lieutenants Longstreet and Selden and 14 men wounded.

The affair at the San Cosme gate was the last action in Mexico in which the regiment was engaged. Seventy-one enlisted men of the regiment received certificates of merit for brave and meritorious service during the war.

The march towards the coast for home began June 12, 1848, and the regiment embarked at Vera Cruz July 16, on the transport *Alexandria*, the bark *John Davis*, and the brig *Apalachicola*, arriving at New Orleans July 24 and 25, 1848.

From New Orleans the regiment was transferred to Jefferson Barracks by steamer *Missouri*, arriving August 1, 1848, but in November was ordered to Texas via New Orleans, reaching Port Lavacca December 18, where camp was established about one mile from town.

Companies A, E, G, I and K.—the right wing,—left camp on the 21st December, and by easy marches reached a camp on the Guadalupe River, near Victoria, on the 29th. On the night of the 21st, cholera attacked the left wing.—Companies B, C, D, F and H,—and in the course of a few hours became epidemic, so much so as to prevent the troops moving from the camp to join the right wing. The disease attacked the right wing also, but

not with such virulence as it did the left. It attained its height on the 24th, and had almost disappeared on the 27th.

Major Morrison's report, dated January 5, 1849, gives a concise account of this disaster.

"The cholera broke out as an epidemic in the regiment on the 21st December, and has nearly destroyed it, one-third of the men falling victims to it. Such has been its virulence that one-half of the cases terminated fatally in the course of a few hours.

"The disease has been one of those mysterious visitations that cannot be accounted for, as the regiment on its landing at Lavacca was in apparent good health, cheerful, comfortably clothed, subsistence of the best kind, with new tents and everything that could put it in first rate condition for the field."

Early in January, 1849, the regiments were distributed among the forts and camps of Texas which it was to occupy for twelve years. There were many movements of companies in this interval, a number of Indian skirmishes, several collisions with Cortina's outlaws, and many long marches on escort duty or scouting, but no occurrence of general interest.

Brevet Major-General Wm. J. Worth, the colonel of the regiment, died of Asiatic cholera at San Antonio, May 7, 1849, and was succeeded by Colonel John Garland, promoted from the Fourth.

The only movements of the different companies in the early part of the year 1861 (except a change of station of Company K), were made in compliance with an order issued by General Twiggs, the Department commander, for the troops to leave the State by way of the coast. The attempt to comply with this order resulted in the capture of all the regiment by the newly organized military forces of the Confederate States.

Company C, on entering the plaza at San Antonio April 23, was surrounded by an overwhelming force and obliged to surrender. Lieutenant-Colonel Hoffman, commanding the regiment, and the regimental staff and band, were taken prisoners about 10 o'clock the same day at San Antonio. The regimental colors were not captured, and the manner in which they were saved is narrated by Corporal John C. Hesse, Company A, as follows:

"A few days subsequent to the surrender, upon going to the former office of the regimental headquarters, the building being then in possession and under the control of the rebels, I met there Lieutenant Hart, the regimental adjutant, and Sergeant-Major Joseph K. Wilson, 8th Infantry. Our regimental colors being in the office, Lieutenant Hartz proposed to us to take the colors from the staffs, conceal them beneath our clothing and try to carry them off. We did so. I took the torn color which the regiment had carried through the Mexican War, put it around my body under my shirt and blouse, and passed out of the building, which was strongly guarded by rebels. Fortunately the rebels did not suspect what a precious load we concealed with us, for if they had our lives would not have been worth much. We put the colors in one of Lieutenant Hartz's trunks, and next day left San Antonio for the North. On the route we guarded the colors with our lives, always fearing that the rebels might find out what we had

taken away and come after us; but they did not, and we arrived safe with our colors on the 26th of May, 1861, in Washington City, and turned them over to the regiment."

For this act Sergeant Wilson and Corporal Hesse each received a medal of honor.

Companies A and D were captured at Indianola, April 24, and Companies B, E, F, H, I and K, under Captain I. V. D. Reeve, near San Lucas Springs, about 22 miles west of San Antonio, May 9th. Company G had been broken up.

The officers of Captain Reeve's battalion were not paroled as the others had been, but were, with one or two exceptions, held prisoners at San Antonio for about nine months, when they were exchanged. The enlisted men were held until February 25, 1863, during which time they were divided into squads and removed to different posts on the frontiers of Texas, deprived of pay for more than two years, supplied with scanty food and clothing, and made to suffer severe military punishments. Recruiting officers visited them daily, offering them commissions and large bounties to desert their flag. With few exceptions, however, they repelled the bribes and avoided the treason. Those who chose a different course did it to escape their prison.

The officers of the regiment who took commissions in the Confederate service were: Major Theophilus Holmes, Captains Larkin Smith, E. B. Holloway, Joseph Selden and E. D. Blake; First Lieutenants T. K. Jackson, T. M. Jones, R. G. Cole and Lafayette Peck, and Second Lieutenants J. R. Cooke and J. G. Taylor. The opening of the Civil War thus found the Eighth Infantry with its officers and men either prisoners of war, or debarred by their paroles from serving against the enemy; and it was not until October, 1863, that a body which can be considered fairly representative of the regiment could be assembled.

The reorganization of the regiment began May 1, 1861, at Fort Wood, N. Y. Harbor, where Company G was recruited. Company F was reorganized at Newport Barracks, Ky., in July, 1861. Company A at Fort Hamilton February 17, 1862, and D at the same station May 7th. B at Fort Columbus July 29; C at Fort Columbus April 15, 1863; E and I at Fort Columbus, May 22; K on the 9th, and H on the 12th of March, 1865.

Company G took part in the battle of Bull Run, and then, with Company F, was placed on duty in Washington as provost guard.

Companies A and D joined the Army of Virginia under General Banks and on August 9, 1862, were engaged in the action with the Confederate army at Cedar Mountain. On this day the battalion was in the advance, and on the appearance of the enemy Captain Pitcher was directed to throw his command forward as skirmishers. Companies A and D formed the right of the line and advanced towards the enemy's line of battle across an open field with a steadiness and precision which were commented upon by Generals Fitzhugh Lee and Stuart. The line continued to advance until confronted by the main body of the enemy, when, not being supported, it fell back to its second line. How well the companies fought is shown by their losses, which were 8 killed, 8 wounded, and 3 missing,—nearly one-third of the

effective strength. Of the five officers present, three were wounded and two taken prisoners.

Both companies took part in the battle of Antietam and then joined Companies F and G for duty as provost guard at the headquarters of the Army of the Potomac.

While Companies A and D were serving in northern Virginia, Companies F and G had taken part in the Peninsula Campaign as provost guard at General McClellan's headquarters.

Company B arrived at Sharpsburg, October 3, 1862, and the five companies,—A, B, D, F and G,—were now united for the first time since their reorganization. The battalion accompanied the headquarters in all the marches preceding Fredericksburg, in which battle it was engaged December 13, 1862. Company C joined the battalion at Falmouth, Va., April 18, 1863, where the regiment remained during the Chancellorsville campaign. It marched with the army to Gettysburg, but was not actually engaged in the battle, its duties as provost guard keeping it employed in other ways.

A few days after the battle of Gettysburg the regiment was ordered to New York City to suppress the draft riots, and encamped in the City Hall Park from July 17 to 30, 1863, and on the Battery from July 30 to August 22. It remained in New York Harbor until April 23, 1864, being stationed on Governor's Island until March 22, and after that date at Hart's Island. During this interval the various companies performed much detached service, being apparently available for any object which presented itself. The most important of these duties was the suppression of a mutiny on November 7, among certain N. Y. volunteer regiments. Companies B and I put down the mutiny and brought the ringleaders to Fort Columbus.

The regiment left Hart's Island April 21, 1864, and proceeded to Warrenton, Va., where it became the provost guard of the 9th Army Corps. It took part in all the movements of that corps, its detail as provost guard preventing it from engaging actively in any of the battles in which the corps were engaged.

On the 2d of November, 1864, the regiment was sent to Buffalo N. Y., to preserve order during the elections, and thence (November 12, to Baltimore, Md. After several movements of companies in Delaware and Maryland, the regiment was united at Hancock Barracks, Baltimore, Md., August 31, 1865, where it remained during the remainder of the year.

On the 5th of June, 1861, Colonel John Garland, the colonel of the regiment, died at New York, and was succeeded by Colonel Pitcairn Morrison, who retired October 20, 1863, and was succeeded by Colonel Albemarle Cady. Colonel Cady retired May 18, 1864, and was succeeded by Colonel James V. Bomford.

In April, 1866, Companies A, B, D, F, H and K were sent to stations in North Carolina, and Companies E, G and I to Charleston, S. C. Company C went to Winchester, Va., in January, but in September it, too, went to South Carolina. During the reconstruction period in the South the companies changed station very often. The regiment occupied

stations in the Carolinas until May, 1868, after which the whole regiment was in South Carolina.

In 1869, at the time of the reduction of the army, the 8th Infantry was consolidated with the 23d, the order taking effect in May of that year.

The numerous movements of the different companies while the regiment was in the South were due to the inability of the civil authorities to enforce the laws of reconstruction, and the necessity for a military force to support and maintain them. In the execution of their peculiar and unpleasant duties the most prudent and judicious measures were adopted by the officers of the regiment in order to accomplish the ends of justice and prevent bloodshed.

In 1870 the regiment was transferred to David's Island, N. Y. Harbor, in order that it might be in readiness to proceed at any time to the Island of San Domingo to protect the interests of the United States there. With this expectation, the regiment recruited to a "strength present" greater than at any other period of its existence, the regimental return for November, 1870, showing 29 officers and 810 men.

The Chicago fire in October, 1871, was the cause of a part of the regiment (Companies D, E, G and I) being sent to that city for the protection of the property belonging to the sufferers by the fire. The battalion remained in Chicago until May 3, 1872, when it was sent to Utah, where it established and built the post of Fort Cameron. These companies remained continuously at this post until the regiment was moved to Arizona in 1874.

The rest of the regiment remained at David's Island until July, 1872, when it was transferred to the Department of the Platte, arriving at Fort Rice July 21. Here the battalion was attached to the command of Colonel D. S. Stanley, 22d Infantry, designed to accompany and protect the surveyors of the Northern Pacific Railroad. While on this duty the battalion marched about 600 miles and had several collisions with the Indians, but without loss. A similar march was made by Companies B, C, F and H, in 1873, and after its termination in September the battalion was stationed at Fort D. A. Russell, Wyoming.

In February, 1874, the garrison of Fort D. A. Russell was called upon to furnish troops for the purpose of keeping the Ogallalla Sioux on their reservation, and Companies B, C, H, F and K were ordered upon this duty. Fort Laramie was reached February 28, and on the 3d of March the battalion began the march for Red Cloud Agency,—80 miles distant, and the site of the present Fort Robinson,—which was reached on the 8th. Here Company F was left with a battalion of the 13th and 14th, under Captain Van Horn, and Companies B, C, H and K, commanded by Captain Lazelle, continued the march to the Spotted Tail Agency, 41 miles further down White River, where they arrived on the 11th.

For the next four months the little garrison led a very monotonous and circumscribed existence, since "Two Strikes'" band of Sioux and a party of Minneconjous were encamped close by, and the main body under Spotted Tail was only eight miles away.

During this year the regiment was designated for service in Arizona, and

as Colonel Bomford had sustained a paralytic stroke in November, 1873, and was entirely incapacitated for such service, the President retired him from active service on June 8th.

This distinguished officer, who had spent almost a lifetime in the Eighth, was one of the best known and most esteemed of the officers of the old army. To a bravery in battle never surpassed by any one, he united a peculiar kindness and urbanity towards all those, of whatever rank, with whom he came in contact. With his high reputation in the old army and his estimable personal qualities, his failure to attain distinguished prominence in the War of the Rebellion has always been a matter of surprise and a subject for comment among those who knew and admired him. An explanation of this may, however, be found in the fact that, having surrendered in Texas in 1861 as major of the 6th Infantry, his loyalty was for a time unreasonably suspected by the authorities; and still more to the other fact that, at the battle of Perryville, while acting as chief of staff to General McCook and conducting himself with his usual gallantry, he was very severely wounded and virtually incapacitated for further service during the war.

He was succeeded by Colonel August V. Kautz.

The movement to Arizona was begun in July, 1874, and by the end of October the companies were at their new stations,—Headquarters and Company F at Whipple Barracks; A and B at Camp Verde; C at Fort McDowell; D and G at Camp Lowell; E and K at Camp Apache; H at Fort Yuma; and I at Camp Grant.

The 8th Infantry remained in Arizona for four years, during all of which time most of the companies remained at their posts performing the ordinary garrison duties, and in most cases were employed in constructing or enlarging posts, building roads, telegraph lines, etc. The Indians were generally quiet, and no one of the companies was sent into the field as an organization. Many of the officers, however, performed arduous and important service in command of scouting parties, composed of Indian scouts and detachments of the regiment. The only approach to an engagement with the Indians in which the regiment took part, occurred at Camp Apache on July 9, 1876, when Diablo's band of White Mountain Apaches fired into the post from a neighboring hill. Company E, which was the only company of the regiment at that post at the time, turned out at once with the rest of the garrison and attacked the Indians, soon forcing them to retreat up the mountains.

When the Nez Perce war broke out in 1877, Company H joined the column which General Howard had organized against Chief Joseph. It began its march July 30, and during the next three months was engaged in all the marches and other operations of that famous pursuit. Joseph having surrendered, the company was sent back to California, having travelled, by steamer, rail and marching, 7244 miles during the campaign.

In 1878 the regiment was transferred to California, but the transfer was complicated by the Bannock Indian war which broke out while it was in progress. All the companies except E and G were involved in this and were kept constantly in motion while it lasted. At its close the regiment was as-

signed to stations at Benicia Barracks, Angel Island, San Diego, Fort McDermitt, Fort Bidwell, Camp Halleck, and Camp Gaston, with headquarters first at Angel Island, then at Benicia, and finally (March 2, 1880) at Angel Island.

In September, 1881, the Apache Indians broke out again, and after the encounter at Cibicu in which the Indians had the advantage, seven companies of the regiment (A, B, C, D, F, I and K) were selected for field service in Arizona. They were not engaged with the Indians though constantly on the move seeking for them, and by December 20 had all returned to their stations except Company A. This company rejoined at San Diego in March, 1882, only to be sent out again a month later, to return finally May 10, 1882.

The next three years passed without incident, but in the last days of 1885 the Geronimo campaign began and was the cause of the regiment's being sent to Arizona for the third and last time. There was the usual escort and scouting duty to perform and Company E, among its other duties, escorted Indian prisoners in April, 1886, to Fort Marion, Florida, thus finding itself at the station it had occupied 41 years before. In going and returning this company travelled a distance of 4414 miles.

In May Company D was engaged in the pursuit of the Indians under Natchez and Geronimo. The men on this march were reported as completely worn out, barefoot and almost destitute of clothing, and 8 men were sent to Fort Huachuca for medical treatment.

During the month of June, 1886, the intention of keeping the regiment in Arizona seems to have been formed and the companies were assigned to stations.

In July Company I joined Captain Lawton's command in the field and marched rapidly to the Fronteras River in Sonora, remaining in the field until September 10. Detachments from Companies D and K were also on duty with Captain Lawton at this time and were 70 days in pursuit of the Indians, marching a distance of nearly 700 miles through a mountainous and almost inaccessible country.

The campaign against Geronimo having ended, the regiment was transferred in November, 1886, to the Department of the Platte, the headquarters, and Companies A, B, E, F, G and H going to Fort Niobrara, C and I to Fort Robinson, D and K to Fort Bridger.

In August, 1888, the regiment was concentrated in a camp of instruction near Bordeaux, Nebraska, and in 1889 another camp was organized at Fort Robinson. Other troops of all arms were sent to this camp from the various posts in the Department, the whole forming the largest body of regular troops assembled since the war. On September 9th the regiment took part in a practice march conducted in accordance with the conditions of actual warfare and lasting until the 14th, when it returned to camp having marched 70 miles.

Companies I and K were skeletonized in September, 1890.

Although Companies A, B, C and H were called out for service at the Pine Ridge and Rosebud Agencies, they were not actually engaged in the campaign. Company A was the first to reach the battle-field of Wounded

Knee after the battle, and at once began the work of searching out the dead from under the snow by which they were covered, and in caring for the wounded who had survived the intense cold of the previous nights. The campaign having terminated, headquarters and Companies A and H were ordered to Fort McKinney, and at 8.15 P. M., January 31, reached the terminus of the Burlington and Missouri Railroad, where preparations were at once begun for the march to Fort McKinney, 135 miles distant.

The weather was intensely cold and the departure was delayed several days in the hope that it might moderate. On February 3d, there being no prospect of the weather becoming more favorable, the command began its march westward to Fort McKinney. This march, of a week's duration, was probably as severe a test of the endurance of officers and men as the army has ever been called upon to undergo. The extremely low temperature continued to the very end, and was combined with frequent snow storms and blizzards. On several occasions camp was made with little or no wood, and no water other than that obtained by melting snow. At Powder River, when half the route had been traversed, a halt of one day was made to enable the exhausted command to obtain rest and warmth. The command reached Fort McKinney February 10th, where it has since remained.

During the month of March, 1891, Company I was reorganized as a company of Indians, recruited from the Arapahoe and Shoshone tribes of the Wind River Reservation in Wyoming, taking station at Fort Washakie.

On April 20, 1891, Colonel Kautz was promoted brigadier-general, and was succeeded by Colonel J. J. Van Horn, the present colonel.

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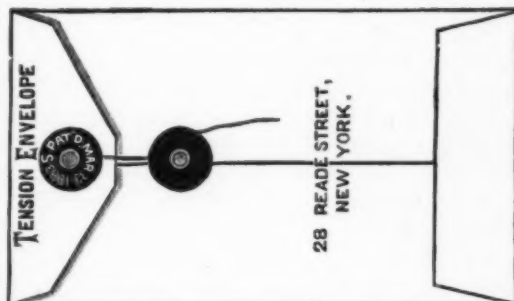
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